NAVAL WEATHER SERVICE

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1975 ANNUAL TYPHOON REPORT

JOINT TYPHOON WARNING CENTER
GUAM, MARIANA ISLANDS

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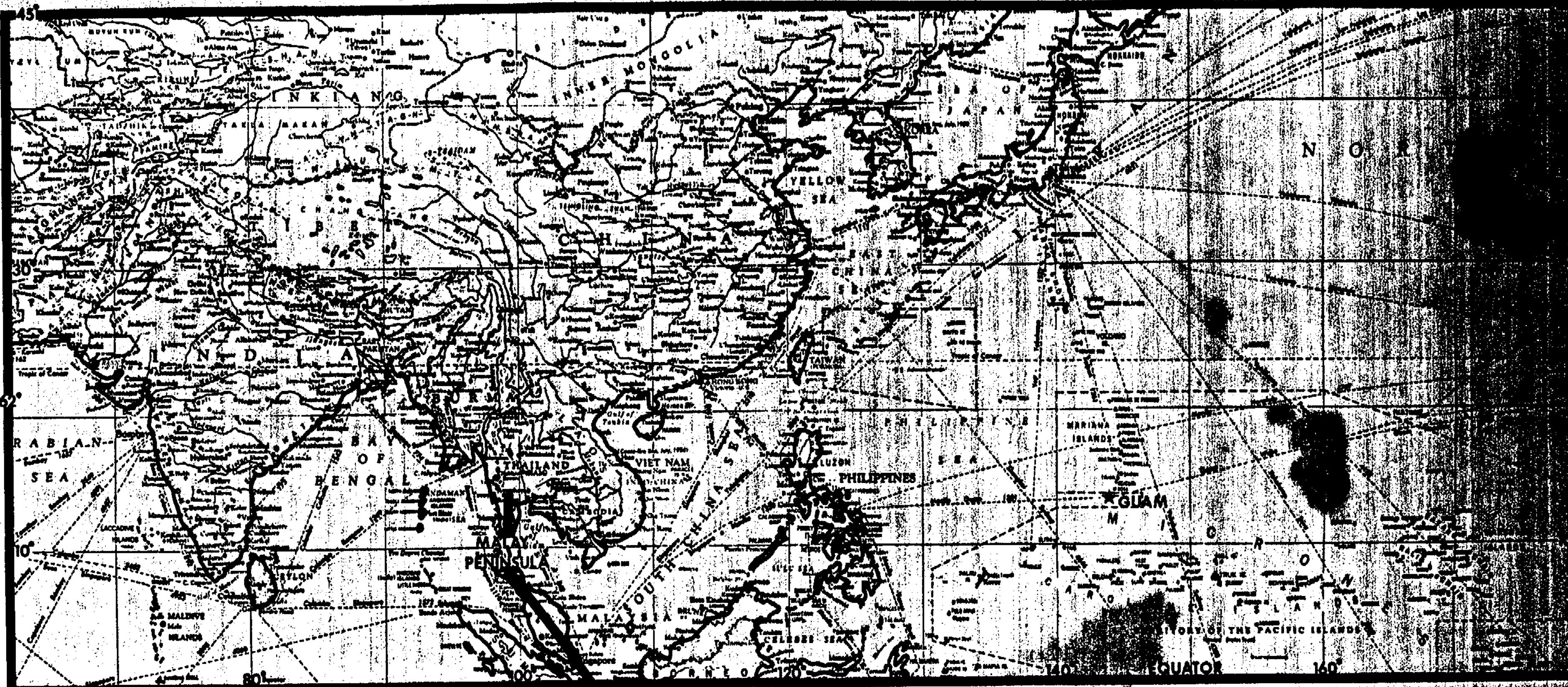

Indian Ocean Area (Malay Peninsula West to 62° E)

Pacific Area (Dateline to Malay Peninsula)

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1975
ANNUAL TYPHOON REPORT

*Departed during 1975 season

FOREWORD

The body of this report summarizes the tropical cyclones of the western and central North Pacific and the North Indian Ocean. The U. S. National Weather Service publishes summaries of eastern North Pacific tropical cyclones in the Monthly Weather Review, the Mariners Weather Log, and Pilot Charts.

Fleet Weather Central/Joint Typhoon Warning Center (FLEWEACEN/JTWC), Guam has the responsibility to:

1. Provide warnings for all tropical cyclones north of the equator, west of the Dateline, and east of 62E;

2. Determine tropical cyclone reconnaissance requirements and assign priorities;

3. Conduct post-analysis programs including preparation of the Annual Typhoon Report; and

4. Conduct tropical cyclone analysis and forecasting research.

Detachment 17/Asian Tactical Forecast Unit, 20th Weather Squadron, Yokota AB, Japan with assistance from the Naval Weather Service Facility, Yokosuka, Japan, is designated as the alternate JTWC in the event that FLEWEACEN/JTWC Guam is incapacitated.

JTWC is an integral part of FLEWEACEN Guam and is manned by officers and enlisted men from the Air Force and Navy. The senior Air force officer is designated as the Director, JTWC, and the senior Naval officer is the JTWC Operations Officer.

The PACOM Tropical Cyclone Warning System (western North Pacific and Indian Ocean) consists of the Joint Typhoon Warning Center, the U. S. Air Force 54th Weather Reconnaissance Squadron stationed at Andersen AFB, Guam, and the Air Force Weather Service Defense Meteorological Satellite Program (DMSP) sites at Nimitz Hill, Guam; Yokota AB, Japan; Kadena AB, Japan; Clark AB, Philippines; Hickam AFB, Hawaii; and the Air Force Global Weather Central, Offutt AFB, Nebraska. Additionally satellite support is provided by the Fleet Weather Facility, Suitland, Maryland.

The Central Pacific Hurricane Center, Honolulu, is responsible for the area from the Dateline eastward to 140W and north of the equator. Warnings are issued in coordination with FLEWEACEN Pearl Harbor and Detachment 4, 1WW, Hickam AFB, Hawaii.

CINCPACFLT, CDRUSACSG, and CINCPACAF are responsible for further dissemination, and if necessary, local modification of tropical cyclone warnings to U. S. military agencies.

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CHAPTER I - OPERATIONAL PROCEDURES

1. GENERAL

Services provided by the Joint Typhoon Warning Center (JTWC) include the following: (1) Significant Tropical Weather Advisories issued daily describing all tropical disturbances and their potential for further development; (2) Tropical Cyclone Formation Alerts issued whenever interpretation of satellite and synoptic data indicates likely formation of a tropical cyclone; (3) Tropical Cyclone Warnings issued four times daily whenever a significant tropical cyclones exists in the Pacific area; (4) Tropical Cyclone Warnings issued twice daily whenever a significant tropical cyclone exists in the Indian Ocean area; and (5) Prognostic Reasoning issued twice daily for all tropical cyclones in the Pacific area.

FLEWEACEN Guam provides computerized meteorological/oceanographical products for JTWC. Communication support is furnished by the Nimitz Hill Naval Telecommunications Center (NTCC) of the Naval Communications Station, Guam.

2. ANALYSES AND DATA SOURCES

a. COMPUTER PRODUCTS:

Varian plotted charts are routinely produced at synoptic times for the surface, 850 mb, 700 mb, and 500 mb. A chart of upper tropospheric data is produced which utilizes 200 mb rawinsonde data and AIREPS above 29,000 ft within 6 hr of the 0000Z and 1200Z synoptic times.

JTWC extensively utilizes the FLEWEACEN Guam Computer Center for objective forecast techniques and statistical post-analysis.

In addition, the standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Weather Central (FNWC) at Monterey, California.

b. JTWC ANALYSES:

(1) Combined surface/gradient-level (3,000 ft) streamline analysis over tropical regions and an isobaric analysis in more northern latitudes and around intense tropical systems at 0000Z and 1200Z. The blend zone between streamlines and isobars fluctuates as the pressure gradient changes from season to season. Low-level wind directions from satellite data are included in the analysis.

(2) 500 mb contour analysis at 0000Z and 1200Z.

(3) Composite upper-tropospheric streamline analysis utilizing rawinsonde data from 300 mb through 100 mb, wind directions extracted from satellite data by Det 1, 1WW and AIREPS at or above 29,000 feet at 0000Z and 1200Z.

(4) Additional sectional analyses similar to those above, at intermediate synoptic times, during periods of tropical cyclone activity.

c. AIRCRAFT RECONNAISSANCE:

These data are invaluable in the positioning of centers of developing systems and essential for the accurate determination of the maximum intensity, minimum sea-level pressure, and radius of significant winds exhibited by tropical cyclones. Aircraft reconnaissance data are plotted on large-scale sectional charts for each mission flown. A comprehensive discussion of aircraft reconnaissance is presented in Chapter II.

d. SATELLITE DATA:

The Defense Meteorological Satellite Program (DMSP) played a major role in the early detection of tropical cyclones in 1975. A discussion of this role, as well as applications of satellite data to tropical cyclone tracking, is presented in Chapter II.

e. RADAR:

During 1975, land radar coverage was utilized more extensively in the selective reconnaissance program than ever before. Once a storm moved within the range of a land radar site, reports were usually received hourly. Use of radar during 1975 is discussed in Chapter II.

3. FORECAST AIDS

a. CLIMATOLOGY:

Various climatological publications listed in earlier Annual Typhoon Reports were utilized in addition to the following recently received publications:
(1) Mariner's Worldwide Climatic Guide to Tropical Storms at Sea. (Crutcher, H. L. and R. G. Quayle, 1974)
(2) Tropical Cyclone Genesis (Gray, W., 1975)
(3) Annual Typhoon Reports, 1959-1974 (FWC/JTWC).

b. OBJECTIVE TECHNIQUES:

The following objective techniques were employed in tropical cyclone forecasting during 1975. A description and an evaluation of these techniques is presented in Chapter V:

(1) TYFN75
(2) MOHATT 700/500
(3) FCSTINT
(4) 12-HR EXTRAPOLATION
(5) HPAC
(6) XT24
(7) INJAH74

4. FORECASTING PROCEDURES

a. INITIAL POSITIONING:

An initial center position is determined from a subjective evaluation of center fix data and synoptic data. When these data sources are not available, extrapolation from the previous position is used.

b. TRACK FORECASTING:

An initial forecast track is developed based on persistence, climatology and objective techniques. This initial track is subjectively modified based on the following:

(1) The prospects for recurvature are evaluated for all westward and northward moving storms. This evaluation is based primarily on present and forecast positions and amplitude of middle tropospheric mid-latitude troughs from the latest 500 mb analysis and numerical progs.

(2) Determination of steering level is partly influenced by maturity and vertical extent of the system. For mature storms located south of the 500 mb subtropical ridge, forecast changes in speed of movement are closely correlated with forecast changes in the intensity of the ridge. When steering currents are very weak, the tendency for storms to move northward due to internal forces is an important consideration.

(3) Over the 12- to 72-hr forecast spectrum, speed of movement during the early time frame is biased towards persistence while that near the end of the time frame is biased towards analogs and climatology.

(4) A final check is made against climatology to ascertain the likelihood of the forecast track. If the forecast deviates greatly from climatology, the forecast rationale is reappraised and the track adjusted as necessary.

c. INTENSITY FORECASTING:

In forecasting intensity, heavy reliance is placed on aircraft reconnaissance reports, the Dvorak satellite interpretation model, and the objective techniques discussed above. Additional considerations are the position and intensity of the tropical upper-tropospheric trough, extent and intensity of upper-level outflow, sea surface temperature, terrain influences, speed of movement, and proximity to an extratropical environment.

5. WARNINGS

Tropical cyclone warnings are numbered sequentially. If warnings are discontinued and the storm reintensifies, warnings are numbered consecutively from the last warning issued. Amended or corrected warnings are given the same number as the warnings they modify plus a sequential alphabetical designator. Each warning includes the location, intensity, direction and speed of movement, and the radial extent of 30, 50, and 100 kt surface winds (when applicable). Warnings within the JTWC Pacific Area are issued within two hours of 0000Z, 0600Z, 1200Z and 1800Z with the constraint that two consecutive warnings may not be more than seven hours apart. This variable warning time allows for maximum use of all available reconnaissance platforms and spreads the workload in multiple storm situations. The forecast intervals for all tropical cyclones, regardless of intensity, are 12-, 24-, 48-, and 72-hr. Warnings in the JTWC Indian Ocean area are issued within two hours of 0800Z and 2000Z with the constraint that two consecutive warnings may not be more than fourteen hours apart. Warnings for this area are issued only after a tropical cyclone has attained an intensity of greater than 33 kt. Forecast intervals are 24- and 48-hr.

Warning forecast positions are verified against the corresponding post analysis "best track" positions. A summary of the verification results for 1975 is presented in Chapter V.

6. PROGNOSTIC REASONING MESSAGE

In the Pacific area, prognostic reasoning messages are transmitted at 0000Z and 1200Z. This message is intended to provide field meteorologists with the reasoning behind the latest JTWC forecast. Prognostic reasoning messages are not prepared for the Indian Ocean area.

7. SIGNIFICANT TROPICAL WEATHER ADVISORY

This message, summarizing significant weather in the entire JTWC area of responsibility, is issued at 0600Z daily. It contains a detailed, non-technical description of all significant tropical disturbances, and the JTWC evaluation of potential for tropical cyclone development.

8. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued whenever interpretation of satellite and other meteorological data indicates that formation of a significant tropical cyclone is likely. These alerts are valid for 24 hr unless reissued, cancelled, or superseded by a warning.

CHAPTER II - RECONNAISSANCE & COMMUNICATIONS

1. GENERAL

The Joint Typhoon Warning Center relies primarily on two reconnaissance platforms to provide the required fix data for tropical cyclone warnings. In 1975 these two platforms, namely aircraft and satellite, provided 85.9 percent of the fixes used for tropical cyclone warnings in the western North Pacific with land radar, synoptic data, and extrapolation forming the basis of the remaining 14.1 percent. In addition, another 196 satellite fixes were made in the Indian Ocean. Timely satellite coverage was hampered this year with the loss of local readout capabilities and eventual total loss of an afternoon and an early morning satellite over the western North Pacific.

2. RECONNAISSANCE RESPONSIBILITY AND SCHEDULING

Aircraft weather reconnaissance is performed in the JTWC area of responsibility by the 54th Weather Reconnaissance Squadron (54WRS). The squadron, presently equipped with WC-130 aircraft, is located at Andersen Air Force Base, Guam. The JTWC reconnaissance requirements are sent daily during the typhoon season to the Tropical Cyclone Aircraft Reconnaissance Coordinator (TCARC). These requirements include areas to be investigated, fix times and forecast position of cyclones to be fixed, and synoptic tracks to be flown. IAW CINCPACINST 3140.1M, "Usage of reconnaissance assets in acquiring meteorological data from aircraft, satellite, and landbased radar shall be at the discretion of FLEWEACEN/JTWC, Guam based on the following priorities: (1) Alert flights and vortex or center fixes as required for issuance of tropical cyclone warnings in the Pacific area of responsibility; (2) Center or vortex fixes as required for issuance of tropical cyclone warnings in the Indian Ocean area of responsibility. Vortex fixes will not be levied until maximum sustained winds are estimated to exceed 33 kt and the location and forecast movement imply a threat to DOD interests; (3) Supplementary fixes; and (4) Synoptic data acquisition".

As in previous years, aircraft reconnaissance provided direct measurements of height, temperature, flight level winds, sea level pressure, and numerous other parameters. These data are vital to the forecaster for indications of changing cyclone characteristics, thus providing a broader basis for tropical cyclone warnings. Another important aspect of this data is its availability for research in tropical cyclone analysis and forecasting.

DMSP satellites provide day and night coverage of the JTWC area of responsibility. Interpretation of this satellite imagery provides cyclone positions and for daytime passes, provides estimates of intensities using the DVORAK technique (NOAA TECHNICAL MEMORANDUM, NESS-45 and FIRST WEATHER WING PAMPHLET 105-10). This year the readout was only available at JTWC in a timely manner for the 0000Z and 1200Z warnings. However, Air Force Global Weather Central, Offutt AFB provided position data from an afternoon satellite for much of the season until this satellite lost its capability to transmit. As in 1974 satellite coverage of the western North Pacific proved extremely useful in identifying areas of possible tropical cyclone formation, thus reducing the number of aircraft investigative flights on systems that did not later become tropical cyclones.

Land radar provides useful positioning data on well developed cyclones when in the proximity (usually within 200 nm of radar position) of the Republic of the Philippines, Hong Kong, Taiwan, Japan (including the Ryukus), and Guam.

3. AIRCRAFT RECONNAISSANCE EVALUATION CRITERIA

The following criteria are used to evaluate reconnaissance support to JTWC.

a. Six-hour fixes- To be counted as made on time, a fix must satisfy the following criteria:

(1) Fix must be made not earlier than 1 hr before, nor later than 1/2 hr after scheduled fix time.

(2) Aircraft in area requested by scheduled fix time, but unable to locate center due to:

(a) Cyclone dissipation; or

(b) Rapid acceleration of the cyclone away from the forecast position.

(3) If penetration not possible due to geographic or other flight restrictions, aircraft radar fixes are acceptable.

b. Levied 6-hr fixes made outside the above limits are evaluated as follows:

(1) Early-fix is made within the interval from 3 hr to 1 hr prior to scheduled fix times. However, no credit will be given for early fixes made within 3 hr of the previous fix.

(2) Late-fix is made within the interval from 1/2 hr to 3 hr after scheduled fix time.

c. When 3 hr fixes are levied, they must satisfy the same time criteria discussed above in order to be classified as made on time. Three-hour fixes made that do not meet the above criteria are classified as follows:

(1) Early-fix is made within the interval from 1 1/2 hr to 1 hr prior to scheduled fix time.

(2) Late-fix is made within the

interval from 1/2 hr to 1 1/2 hr after scheduled fix time.

d. Fixes not meeting the above criteria are scored as missed.

e. Levied fix time on an "as soon as possible" fix is considered to be:

(1) Sixteen hour plus estimated time enroute after an alert aircraft and crew are levied; or

(2) Four hours plus estimated time enroute after the DTG of message levying an ASAP fix if an aircraft and crew, previously alerted, are available for duty.

f. Investigatives-to be counted as made on time, investigatives must satisfy the following criteria:

(1) The aircraft must be within 250 nm of the specified point by the scheduled time.

(2) The specified flight level and track must be flown.

(3) Reconnaissance observations are required every half-hour in accordance with AWSM 105-1. Turn and mid-point winds shall be reported on each full observation within 250 nm of the levied point.

(4) Observations are required in all quadrants unless a concentrated investigation in one or more quadrants has been specified.

(5) Aircraft must contact JTWC before leaving area of concern.

g. Investigatives not meeting the time criteria of paragraph f, will be classified as follows:

(1) Late-aircraft is within 250 nm of the specified point after the scheduled time, but prior to the scheduled time plus 2 hr.

(2) Missed-aircraft fails to be within 250 nm of the specified point by the scheduled time plus 2 hr.

4. AIRCRAFT RECONNAISSANCE SUMMARY

During the 1975 tropical cyclone season 212 six hourly vortex fixes and 5 supplementary vortex fixes were levied (Table 2-1). This is a significant decrease from 1974 and is the lowest number of aircraft levies since the 1965 season. This is due primarily to the low level of storm activity observed in 1975, which was 30% below the long-term average. Continuing heavy reliance on DMSP data is an important contributing factor to this decrease in aircraft levies. In addition to vortex fixes, 21 investigative flights were levied by JTWC in 1975. Approximately 49% of all warnings were based on aircraft fixes, 36% on satellite data and the remaining 15% based on radar, synoptic data or extrapolated positions.

Reconnaissance effectiveness is summarized in Table 2-1. The missed fix rate of 3.2% is a considerable improvement over 1974.

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

	NUMBER OF FIXES	PERCENT
COMPLETED ON TIME	200	92.2
EARLY	1	0.5
LATE	9	4.1
MISSED	7	3.2
TOTAL	217	100.0

LEVIED VS. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965-1970	507	10	2.0
1971	802	61	7.6
1972	624	126	20.2
1973	227	13	5.7
1974	358	30	8.4
1975	217	7	3.2

5. SATELLITE RECONNAISSANCE SUMMARY

Satellite reconnaissance of tropical cyclones is performed by the Air Weather Service, using Defense Meteorological Satellite Program (DMSP) Data. A unique network of tactical DMSP readout sites throughout the Pacific (at Nimitz Hill, Guam; Kadena AB, Japan; Yokota AB, Japan; Hickam AFB, Hawaii; and at Clark AB, Philippines, which relocated from Nakon Phanom, Thailand in September 1975) and Air Force Global Weather Central (AFGWC) at Offutt AFB, Nebraska, daily monitor the western North Pacific and Indian Oceans for tropical cyclone activity. When a tropical cyclone matures and is in warning status, this network provides JTWC with positions and intensity estimates (ref. NOAA TM 45). During 1975, 99% reliability in satisfying JTWC warning requirements was achieved by utilizing the dual-site coverage philosophy which insures that two sites are providing inputs for each fix.

Several important developments occurred in 1975. Typhoon Winnie, Tropical Storms Susan and Doris, and Tropical Depressions 05, 24 and 25 were monitored without the use of aircraft reconnaissance. Winnie was the first WESTPAC typhoon to be handled in this manner. At CINCPAC's direction JTWC's Indian Ocean area of responsibility was expanded westward from longitude 80°E to 62°E. As a result, the DMSP network became involved in monitoring a significantly larger portion of the tropical oceans, and AFGWC's role of providing tropical cyclone positions and intensity estimates to JTWC was expanded.

Satellite positions are assigned Position Code Numbers (PCN's), depending on the procedures used to make the position, and the state of the cyclone's circulation. These are shown in Table 2-2.

A comparison of DMSP derived positions and JTWC Best Tracks is shown in Table 2-3.

Table 2-3 is important because it demonstrates that the PCN groupings are statistically stable from year to year, and represent an operationally reproducible system for storm fix classification. It shows that the DMSP analyst can accurately identify the organization of tropical cyclones by cloud signatures, that positioning accuracies are improved by using geographical references to correct the gridding, and that the better a tropical cyclone is organized the more accurately it can be positioned by satellite data. Note that geographical checks on gridding are of particular significance if the eye of the storm is apparent. The small improvement in positioning accuracy in 1975 may be a result of greater operational experience, as well as more reliance on satellite data in Best Track determinations. This is certainly true when the satellite is the only available reconnaissance platform.

TABLE 2-2. POSITION CODE NUMBERS

PCN	METHOD OF CENTER DETERMINATION/GRIDDING
1	EYE/GEOGRAPHY
2	EYE/EPHEMERIS
3	WELL DEFINED CC/GEOGRAPHY
4	WELL DEFINED CC/EPHEMERIS
5	POORLY DEFINED CC/GEOGRAPHY
6	POORLY DEFINED CC/EPHERMERIS

CC=Circulation Center

TABLE 2-3. Mean Deviations (nm) of DMSP Derived Tropical Cyclone Positions from JTWC Best Track Positions, 1973-1975 (all sites). Number of cases shown in parentheses.

PCN	1973 (GUAM)	1974 (ALL SITES)	1975 (ALL SITES)
1	15.5(129)	13.6(224)	11.8(214)
2	20.0(17)	17.4(37)	20.4(35)
3	20.3(252)	20.1(422)	21.2(271)
4	20.0(24)	23.9(70)	22.4 (50)
5	45.9(163)	35.4(342)	34.2(323)
6	29.6(20)	49.4(108)	44.7(71)
1&2	16.0(146)	14.2(261)	13.0(249)
3&4	20.3(276)	20.6(492)	21.4(321)
5&6	44.1(183)	38.8(450)	36.1(394)
TOTAL	26.4(605) (23 storms)	26.0(1203) (35 storms)	25.2(964) (25 storms)

The most significant problem in DMSP reconnaissance support to JTWC is the availability and timeliness of spacecraft. To satisfy the JTWC requirement, DMSP data must be available within a specified time frame. The variable warning time allows for some warning time flexibility so satellite reconnaissance inputs can be maximized, but near real time DMSP inputs continue to be essential. Decreased direct-readout coverage in WESTPAC is reflected by the drop in the DMSP use rate for warnings from 43.8% in 1974 to 36.4% in 1975. The critical impact of direct readout capabilities on the viability of the DMSP support to JTWC is obvious. The future of DMSP reconnaissance will be heavily dependent upon the successful exploitation of the new generation (5D) DMSP spacecraft in mid-1976.

6. RADAR RECONNAISSANCE SUMMARY

During the 1975 typhoon season 446 radar center fixes were received at JTWC; 444 from land stations and 2 from WC-130 aircraft of the 54WRS. This number is less than one-half the number received during the 1974 season (997). The decrease is primarily due to the speed of movement of the systems. Although the number of storms within radar acquisition was similar in 1974 and 1975 (16 and 14 respectively), the speed of the 1975 storms was nearly twice that of those of the previous year. Of the 14 tropical storms and typhoons that came under radar surveillance, seven, Mamie, Nina, Ora, Phyllis, Rita, Betty and Cora, had tracks within range of Japan and/or the Ryukyu Islands, where the Japanese Meteorological Agency has established an extensive and highly reliable radar network. These seven tropical cyclones accounted for 78% of all radar reports. Surprisingly, this is the identical percentage of reports produced by the seven storms that traversed the Japan-Ryukyu region during 1974. Typhoon Rita, which meandered from the southern Ryukus to northern Japan, accounted for 104 reports or 23% of the 1975 total. Four storms, Nina, Ora, Phyllis and Rita, were at some time under the surveillance of four different radar sites. Rita was tracked by eight separate radar stations during her life.

Most radar reports are placed into three categories of accuracy defined in the WMO radar code. The categories are: good {within 10 km (5.4 nm)}, fair {within 10-30 km (5.4-16.2 nm)} and poor {within 30-50 km (16.2-27 nm)}. Of the 389 reports coded in this manner, 48% were good, 6% were fair and 46% were poor. Radar reports made only while storms were of typhoon intensity had 47% in the good category. All radar reports were compared to the JTWC best track and the mean vector deviation was 10.1 nm, the smallest deviation since the 1970 season. The two aircraft radar fixes deviated 16.1 nm from the JTWC best track.

Of the 444 radar reports, 78% were obtained from sites in the Japan-Ryukyu network, 14% from Taiwan, 4% from the Philippines, 3% from the Royal Observatory at Hong Kong and 1% from Guam. Radars of National Meteorological Agencies accounted for an impressive 90% of all reports while AC&W and U. S. Air Force Weather Service units accounted for 5% each.

During the 1975 season 17 warnings (4.1%) were based on radar.

7. COMMUNICATIONS

JTWC receives its data and disseminates its warnings through a variety of communication systems, including AUTOVON, AUTODIN, the Naval Environmental Data Network (NEDN), and the Air Force's Automated Weather Network (AWN). Much of the basic meteorological intelligence is received via the NEDN and graphically displayed by

FWC computers. More timely observations, tailored bulletins, and reports are received by JTWC on a dedicated AWN circuit directly from the AWN switch at Clark AB. Autodin is used for dissemination of warnings which are subsequently also transmitted on the AWN. Some more unique communication procedures are discussed below.

a. AIR TO GROUND

Aircraft reconnaissance data are normally received by JTWC via direct phone patch through the Andersen Aeronautical Station, which is the primary station for this purpose. Under degraded radio propagation conditions, the Clark or Yokota Aeronautical Stations can intercept and relay the data via AUTOVON and teletype to JTWC.

The preliminary eye/center data message contains sufficient information to permit JTWC to begin early preparation of individual warnings. Average communication delays for the preliminary and the complete eye/center data messages were 21 and 49 minutes, respectively in 1975. In the past three years, they have stabilized near 19 and 48 minutes, respectively. Delay times are defined as the difference between the fix time and the time of message receipt at JTWC. Table 2-4 depicts the complete eye/center data messages received more than 1 hr after fix time and after warning time.

TABLE 2-4. 1975 AIR/GROUND DELAY STATISTICS FOR AIRCRAFT RECONNAISSANCE

	1971	1972	1973	1974	1975
%Complete fix messages delayed over one hour	6	6	20	19	20
%Complete fix messages received after warning time	2.1	5.5	10.1	4.9	3.7

b. SELECTIVE RECONNAISSANCE PROGRAM

With the advent of the SRP, the importance of radar and satellite fix data has continued to increase. Data from the AC&W radar sites in the Republic of the Philippines and from nationally operated radars of the Republic of China, Hong Kong, Japan, and the Philippines are recieved at JTWC by means of the AWN.

Over 1000 position and intensity estimates were derived from Air Weather Service (AWS) DMSP sites and the Air Force Global Weather Central during 1975. The data from the AWS DMSP sites were immediatley passed via AUTOVON followed by an AWN message. AUTOVON provided rapid communication of the essentials and a brief two-way discussion of the data (a benefit not possible by message).

c. OUTGOING COMMUNICATIONS

Messages originating at JTWC are processed by the Naval Telecommunications Center (NTCC) of the Naval Communications Station, Guam. By special agreement, all tropical cyclone warnings are placed in the communications system before pending IMMEDIATE precedence traffic. In 1975, warnings were delivered to the message center an average of 25 minutes before warning time with an average handling time of 8 minutes. The time of receipt of a warning at a particular station depends upon factors beyond the control of either JTWC or NTCC.

CHAPTER III - RESEARCH SUMMARY

1. GENERAL

One of the four major tasks of the Joint Typhoon Warning Center is to conduct tropical cyclone post-analysis and forecasting research. In most cases research projects are directly concerned with improvements of either speed or intensity forecast of tropical cyclones. Meteorologists from outside agencies such as the Naval Environmental Prediction Research Facility, the Naval Postgraduate School, the 54th Weather Reconnaissance Squadron, and Detachment 1, 1st Weather Wing often collaborate with JTWC on research projects. The following abstracts summarize research completed during the past year. ~~Research~~ underway, ~~but incomplete, is not reported in this section~~.

2. TROPICAL CYCLONES AFFECTING GUAM

(Holliday, C. R., FLEWEACEN/JTWC Tech Note 75-3).

A climatology of tropical storms passing within 180 nm of Guam is presented for the period 1948-1975. A review of all typhoons affecting Guam is carried back to 1800 and some noteworthy typhoons of the 1600's are included. The survey encompasses the frequency, behavior, meteorological effects and descriptive chronicles of Guam tropical storms. The major emphasis is on the period since World War II.

3. DOUBLE INTENSIFICATION OF TYPHOON GLORIA, 1974, AND A BRIEF REVIEW OF SIMILAR OCCURRENCES

(Holliday, C. R., FLEWEACEN/JTWC Tech Note 76-1).

In November 1974 Typhoon Gloria displayed unusual intensity fluctuations while traversing the Philippine Sea. The typhoon exhibited two marked intensifications separated by a period of weakening lasting 12 hr. A chronological examination of this unusual behavior utilizing aircraft reconnaissance and satellite data is presented with particular emphasis on the evolution of the central core region. A parallel between observed events, and results demonstrated in a tropical cyclone numerical model responding to artifical enhancement of the convective heating functions is noted. Similar occurrences of double deepening of typhoons in the western Pacific are reviewed to determine Gloria's uniqueness.

4. A REEVALUATION OF THE CHANGE IN SPEED AND INTENSITY OF TROPICAL CYCLONES CROSSING THE PHILIPPINES.

(Sikora, C. R., FLEWEACEN/JTWC Tech Note 76-2).

The effects of the Philippines on the speed (transit time) and intensity of tropical cyclone crossings is examined. The Philippines have been stratified into two areas, north and south of 14.5N. Significant differences in speed are found to exist between the two areas, while the intensity profiles are similar to those from an earlier study (Brand, 1972) which indicated that maximum intensities are attained 6-12 hr prior to landfall. In both areas, storm speeds generally decrease to a minimum 12-24 hr prior to landfall and then increase significantly as storms accelerate across the Philippines.

5. AN INVESTIGATION OF EQUIVALENT POTENTIAL TEMPERATURE AS A MEASURE OF TROPICAL CYCLONE INTENSITY.

(Sikora, C. R., FLEWEACEN/JTWC Tech Note 76-3).

Several investigators of tropical and mid-latitude sounding data have attempted to differentiate between the "disturbed" and the "undisturbed" states of the atmosphere. Although small temperature differences and relatively large and variable moisture differences are observed, these two parameters still do not adequately describe the varying energy states. The total energy of a parcel of air may be closely approximated by the equivalent potential temperature (θe) and the total static energy (σ), which are highly conservative with respect to both saturated and unsaturated adiabatic processes.

Sounding data from Clark Air Base in the Republic of the Philippines and tropical cyclone dropsonde data have been analyzed for θe. It is shown that a mid-tropospheric minimum in total energy vanishes as a tropical cyclone approaches Clark Air Base, with subsequent increases in θe extending through 400 mb. From an analysis of dropsonde data obtained in tropical cyclone centers, large values as well as rapid increased in θe are observed near 700 mb for those tropical cyclones which are deepening explosively. Since these changes in θe are not the result of synoptic scale motions nor horizontal advective processes, it is proposed that they are the result of the direct mechanical lifting of heat and moisture in the form of convective "hot towers". Using these values of θe, a procedure for forecasting the explosive deepening of tropical cyclones is proposed.

6. MODIFIED TWENTY-FOUR HOUR EXTRAPOLATION AS A FORECAST TECHNIQUE FOR THE MOVEMENT OF TROPICAL CYCLONE

(Sikora, C. R., FLEWEACEN/JTWC Tech Note 76-4).

Twelve-hour extrapolation (XTRP) and the TYFOON analog program are the most successful objective techniques used by JTWC for forecasting the movement of tropical cyclones. The critical parameters for both

techniques are the current warning position and the past 12-hr warning position. However, during operational use of these techniques it was observed that these positions based on later data had to be frequently readjusted.

It is proposed that 24-hr extrapolation technique (XT24) based on reconnaissance positions preferably from the same reconnaissance platform, is more realistic: (1) these data are real-time whereas the warning positions are merely extrapolated from the reconnaissance positions and (2) a 24-hr period tends to smooth out erratic short-term movements in the storm track. This technique was applied to 15 typhoons from 1974 and 2 typhoons from 1973. Since initial results were encouraging, an operational evaluation of XT24 was conducted during the 1975 tropical cyclone season.

CHAPTER IV - SUMMARY OF TROPICAL CYCLONES

1. GENERAL RESUME

a. WESTERN NORTH PACIFIC

1975 saw a sharp decrease in tropical cyclone activity from last season (Table 4-1). There were only 20 named tropical cyclones in 1975, a 30% decrease from the long-term average of 28.6 (Table 4-2). Since 1945, only 1973 exceeds 1975 for total number of consecutive days without a named tropical cyclone. The record in 1973 was 183 consecutive days, while in 1975 180 days elapsed between Typhoon Lola in January and Tropical Storm Mamie in July. Of the 20 named tropical storms occurring between 27 July and 24 November, thirteen became typhoons. Three of these, Nina, Elsie and June became super typhoons with maximum winds exceeding 130 kt. The most noteworthy event of the 1975 season was the occurrence of Super Typhoon June, the most intense tropical cyclone ever recorded. Table 4-3 depicts the distribution of typhoons by month and year.

TABLE 4-1. 1975 TROPICAL CYCLONES

PACIFIC AREA

CYCLONE	TYPE	NAME	PRD OF WRNG	CALENDAR DAYS OF WARNING	MAX SFC WIND	MIN OBS SLP	NO. OF WARNINGS TOTAL	WARNINGS AS TY	DISTANCE TRAVELED
01	TY	LOLA	22 JAN-28 JAN	7	70	976	25	3	1800
02	TD	---	23 APR-28 APR	6	25	004	19	---	605
03	TS	MAMIE	27 JUL-29 JUL	3	40	994	10	---	774
04	TY	NINA	31 JUL-04 AUG	5	135	904	15	8	1084
05	TD	---	06 AUG-07 AUG	2	30	---	4	---	293
06	TY	ORA	10 AUG-12 AUG	3	65	976	10	4	630
07	TY	PHYLLIS	12 AUG-18 AUG	7	120	920	27	15	1622
08	TY	RITA	18 AUG-23 AUG	6	80	966	23	7	1465
09	TS	SUSAN	*	6	50	---	19	---	816
10	TY	TESS	02 SEP-10 SEP	9	95	945	33	22	1613
11	TS	VIOLA	05 SEP-07 SEP	3	45	996	10	---	416
12	TY	WINNIE	09 SEP-12 SEP	4	65	---	13	4	1188
13	TY	ALICE	16 SEP-20 SEP	5	75	971	18	5	1316
14	TY	BETTY	17 SEP-23 SEP	7	95	944	26	11	1785
15	TY	CORA	01 OCT-06 OCT	6	105	943	21	11	2376
16	TS	DORIS	03 OCT-06 OCT	4	55	---	10	---	470
17	TY	ELSIE	09 OCT-15 OCT	7	135	900	25	14	1656
18	TD	---	15 OCT-17 OCT	3	30	002	8	---	432
19	TY	FLOSSIE	20 OCT-23 OCT	4	70	977	15	4	798
20	TS	GRACE	25 OCT-02 NOV	8	60	994	29	---	1940
21	TS	HELEN	03 NOV-04 NOV	2	45	998	6	---	375
22	TY	IDA	06 NOV-11 NOV	6	85	959	22	8	1865
23	TY	JUNE	16 NOV-24 NOV	9	160	876	32	25	2641
24	TD	---	27 DEC-28 DEC	2	30	---	5	---	211
25	TD	---	27 DEC-29 DEC	3	30	---	10	---	227
			1975 TOTALS	110**			435	141	
			INDIAN OCEAN AREA						
	TC 04-75		10 JAN-11 JAN	2	35	---	3	---	271
	TC 24-75		02 MAY-12 MAY	11	95	---	21	12	842
	TC 25-75		05 MAY-08 MAY	4	70	---	6	1	450
	TC 28-75		20 OCT-22 OCT	3	80	---	4	1	180
	TC 29-75		07 NOV-12 NOV	6	50	---	10	---	799
	TC 33-75		25 NOV-01 DEC	7	35	---	7	---	1310
			1975 TOTALS	33**			51	14	

*SUSAN 26 AUG & 27 AUG AND 29 AUG - 01 SEP
**OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM

TABLE 4-2 FREQUENCY OF TROPICAL STORMS AND TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
AVERAGE (1945-58)	0.4	0.1	0.4	0.5	0.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	22.0
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
AVERAGE (1959-75)	0.5	0.4	0.5	0.8	1.2	1.6	4.6	6.1	4.9	4.1	2.6	1.1	28.6

TABLE 4-3 FREQUENCY OF TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
AVERAGE (1945-58)	0.4	0.1	0.3	0.4	0.7	1.1	2.0	2.9	3.2	2.4	2.0	0.9	16.3
1959	0	0	0	1	0	0	1	5	3	3	2	1	20
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
1973	0	0	0	0	0	0	4	2	2	4	0	0	12
1974	0	0	0	0	1	2	1	2	3	4	2	0	15
1975	1	0	0	0	0	0	1	3	4	3	2	0	14
AVERAGE (1959-75)	0.2	0.1	0.1	0.7	0.9	1.1	2.9	3.8	3.2	3.2	1.6	0.6	18.7

Table 4-4 presents the tropical cyclone formation alert summary. Although the development rate is 74%, it is worthy of note that all 25 tropical cyclones for 1975 were preceeded by a formation alert.

There were 110 calendar days in 1975 during which warnings were issued on numbered tropical cyclones. This is well below the average of 145 warning days (Table 4-7).

During most of July, the monsoonal trough was located along 5N, south of its climatological position between 10N and 15N. The trough was masked late in the month by Tropical Storm Mamie and was reestablished near the normal summertime latitudes as Super Typhoon Nina formed in the Philippine Sea. August saw five numbered tropical cyclones. Of these, Typhoon Ora, Phyllis and Rita were spawned in the trough. Throughout September, the trough was again south of the expected long term mean position. Early October saw the return of the trough to its normal latitude, but in mid month it migrated south again, where it remained throughout November. A total of only 14 named tropical cyclones had their beginnings in the monsoonal trough during 1975.

In late July, T.S. Mamie was initiated by a cyclonic circulation in the tropical upper tropospheric trough (TUTT). The TUTT continued to play an active role, initializing T.S. Susan in August and Typhoons Winnie and Tess in September. The long term statistics show that 15% of WESTPAC tropical cyclones originate in the TUTT. This season's 16% is thus close to a climatological norm.

Various casualty reports indicate that Typhoons Phyllis and Rita accounted for the majority of tropical cyclone related casualties in Japan. Phyllis caused 60 deaths and 146 injuries in mid August. Later in the month, Rita reportedly caused the worst flooding on Hokkaido in ten years. On Taiwan, Typhoon Nina caused 25 deaths and 168 injuries, also sinking a small freighter. Typhoon Betty, in September, caused an additional 12 deaths and injuried scores. The Republic of the Philippines suffered casualties from Typhoon Lola in January and TD's 24 and 25 in December. Most deaths were caused by extensive flooding of low lying areas. Lola accounted for the loss of 30 lives and serious damage to sugar producing areas on the southern islands. TD's 24 and 25, although limited in destructive winds, caused torrential rains and 97 lives were lost in the resulting floods. The greatest at-sea disaster occurred in the South China Sea when Typhoon Flossie sank two timber freighters with the loss of 44 lives in late October.

TABLE 4-4.

PACIFIC AREA

TROPICAL CYCLONE FORMATION ALERT SUMMARY

YEAR	NUMBER OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1972	41	29	32	71%
1973	26	22	23	85%
1974	35	30	36	86%
1975	34	25	25	74%

MONTHLY DISTRIBUTION

	J	F	M	A	M	J	J	A	S	O	N	D
1975	1	0	0	2	1	0	3	6	7	7	5	2

b. NORTH INDIAN OCEAN

The JTWC area of responsibility was expanded in July 1975 to include the entire area north of the equator between the Malay Peninsula and 62E.

Table 4-5 presents statistical data on the frequency of North Indian Ocean cyclones by month and year. May 1975 was an active month, with one cyclone in the Bay of Bengal and another in the Arabian Sea. Aside from this early spurt of activity the season for the North Indian Ocean was climatologically normal.

There were two cyclones in the Arabian Sea during the 1975 season. One occurred in May during the transition from the northeast to the southwest monsoon. Tropical Cyclone 24-75 formed just off the southwest tip of the Indian subcontinent. It tracked northwest and dissipated over water about 300 nm southeast of Oman. Tropical Cyclone 28-75 formed in late October, during the transition to the northeast monsoon. The storm tracked west and then veered northeast to make landfall on the northwest coast of India, with winds estimated at 65 kt.

Four tropical cyclones were recorded for the Bay of Bengal during the 1975 season. Of these, two struck the central Burma coast. Tropical Cyclone 04-75 formed 150 nm north of Sumatra and described a smoothly recurving track to central Burma, making landfall with surface winds under 34 kt. Tropical Cyclone 25-75 organized in the Andaman Sea. The storm initially tracked northwest, later recurving into central Burma with typhoon force winds. The system caused widespread damage and took approximately 80 lives.

Tropical Cyclone 29-75 formed in the south central Bay, and maintained an initial west-northwest track. The storm then curved to the northeast, passing within 50 nm of the east coast of India. The track continued northeast until the system went ashore east of Dacca on 12 November. Tropical Cyclone 33-75 formed in late November and described an erratic track in the southwest portion of the Bay. The storm dissipated over water on 1 December.

c. CENTRAL NORTH PACIFIC

During the 1975 season there were no tropical cyclones reported in the Central North Pacific. No detailed study has yet been conducted to ascertain possible causes for such inactivity, however two environmental anomolies were noted. The first was the slightly depressed sea surface temperature that prevailed over this area during most of the season. Secondly, the upper atmospheric westerly flow extended unusually far to the south. The resulting vertical shear tended to inhibit tropical cyclone development. Table 4-6 summarizes frequency of Central Pacific tropical cyclones by month and year.

TABLE 4-5. FREQUENCY OF NORTH INDIAN OCEAN CYCLONES BY MONTH AND YEAR.

YEAR*	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1971	0	0	0	0	0	0	0	0	0	1	1	0	2
1972	0	0	0	1	0	0	0	0	2	0	1	0	4
1973	0	0	0	0	0	0	0	0	0	1	2	1	4
1974	0	0	0	0	0	0	0	0	0	0	1	0	1
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
AVG**	0.1	***	0.1	0.3	0.7	0.7	0.6	0.4	0.5	1.0	1.1	0.5	5.7

*1971-1974 REPRESENT BAY OF BENGAL CYCLONES ONLY
**1877-1960 AVERAGE (INCLUDING ARABIAN SEA) MARINERS WORLDWIDE CLIMATIC GUIDE TO TROPICAL STORMS AT SEA (H.L. CRUTCHER AND R. G. QUAYLE)
***LESS THAN 0.05 PER MONTH

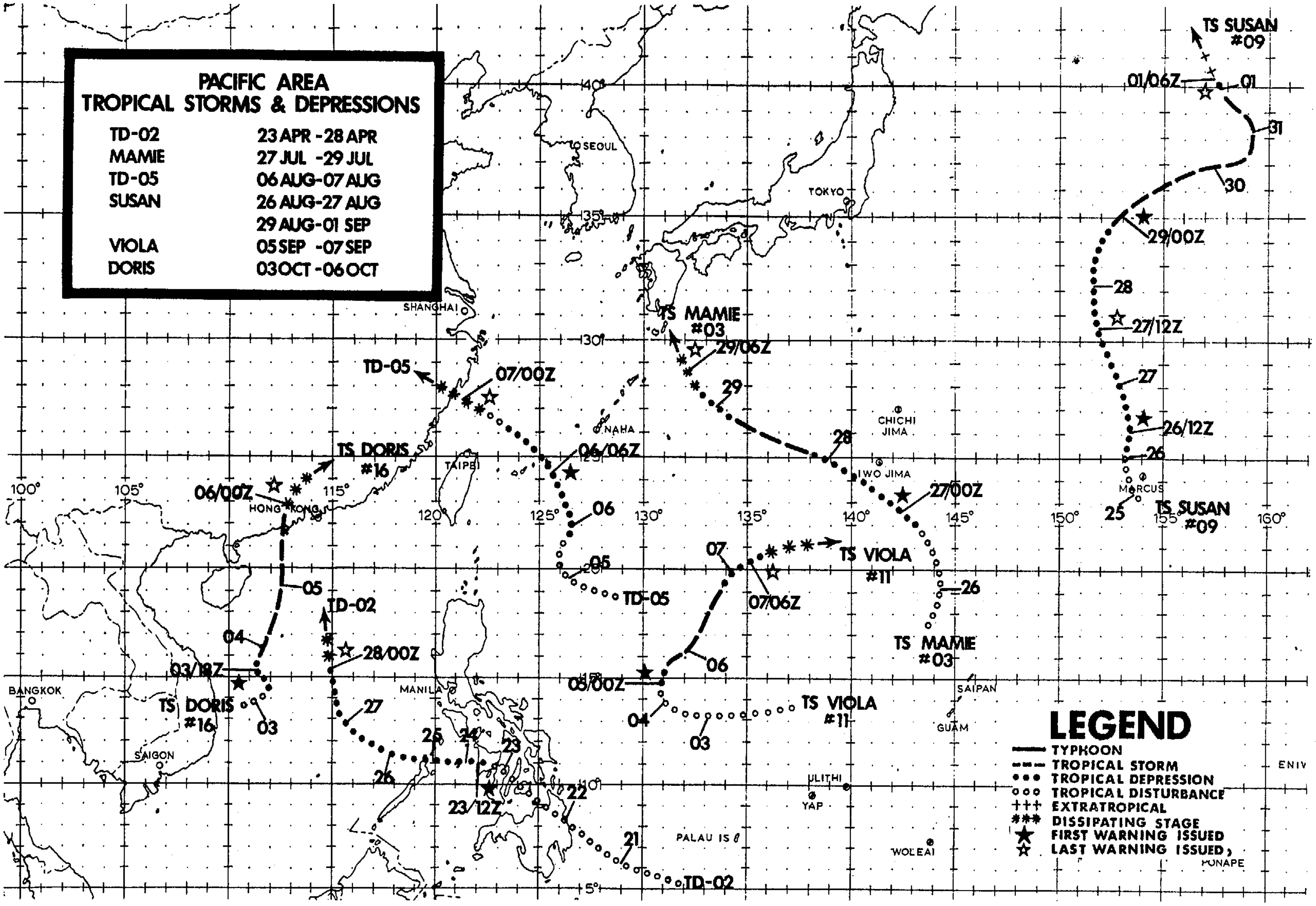
TABLE 4-6. FREQUENCY OF CENTRAL PACIFIC STORMS BY MONTH AND YEAR. (NUMBERS IN PARENTHESIS INDICATE STORMS REACHING HURRICANE INTENSITY)

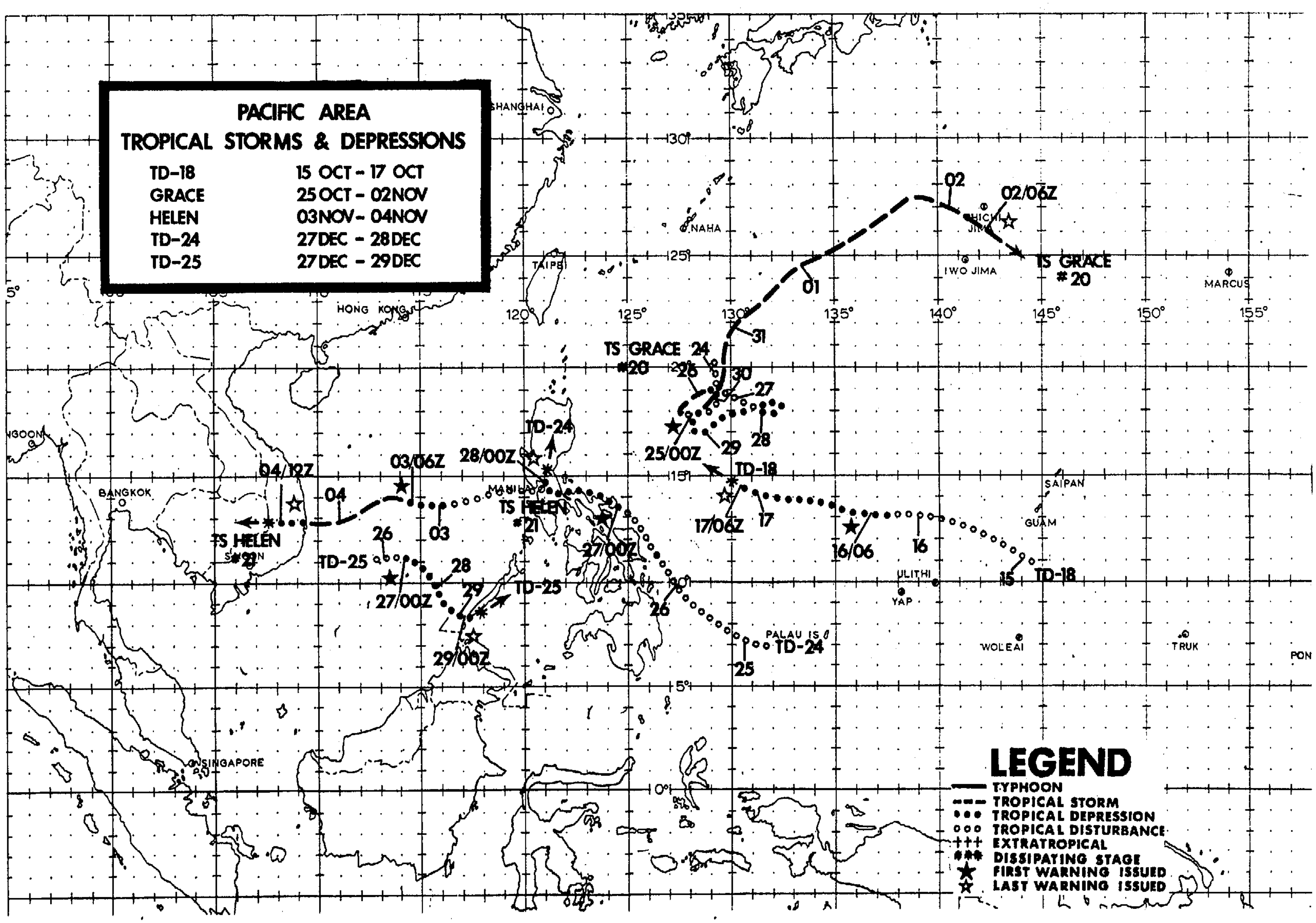
	JAN-JUN	JUL	AUG	SEP	OCT	NOV-DEC
1966	0	0	2 (1)	0	0	0
1967	0	0	0	0	1	0
1968	0	0	2	0	0	0
1969	0	0	0	0	0	0
1970	0	0	1	0	0	0
1971	0	1 (1)	1	0	0	0
1972	0	0	3 (1)	1	0	0
1973	0	1 (1)	0	0	0	0
1974	0	0	2 (1)	0	0	0
1975	0	0	0	0	0	0
AVERAGE	0	.2 (.2)	1.1 (.3)	.1	.1	0

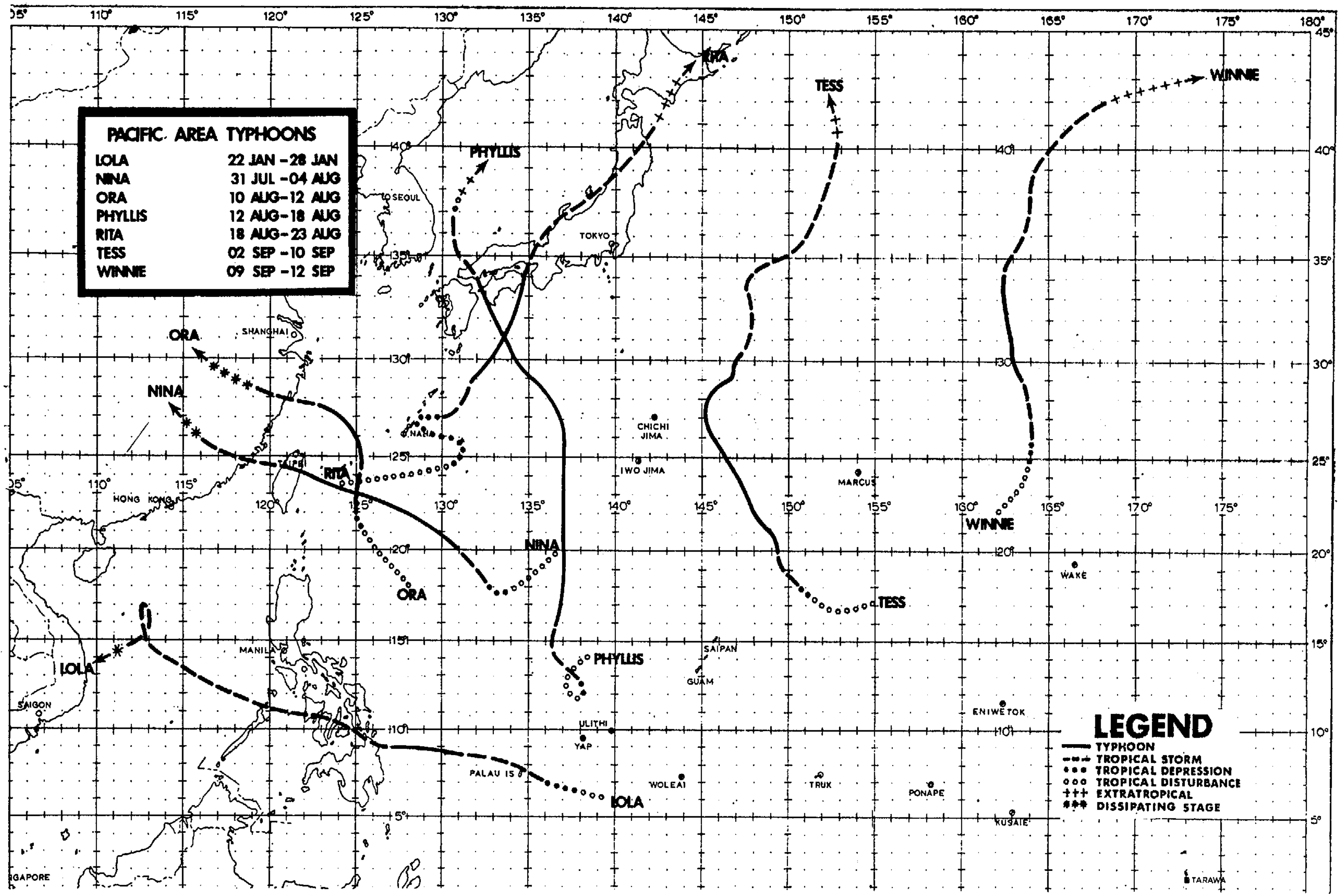
TABLE 4-7. SUMMARY OF JTWC WARNINGS 1959-1975.

	WESTERN NORTH PACIFIC		NORTH INDIAN OCEAN		CENTRAL NORTH PACIFIC	
	1975	AVERAGE 1959-1974	1975	AVERAGE 1971-1974*	1975	AVERAGE 1970-1974
TOTAL NUMBER OF WARNINGS	435	696	51	20	0	39
CALENDAR DAYS OF WARNINGS	110	145	33	12	0	12
NUMBER OF WARNING DAYS WITH TWO CYCLONES	18	50	4	0	0	1
NUMBER OF WARNING DAYS WITH THREE OR MORE CYCLONES	0	10	0	0	0	0
TROPICAL DEPRESSIONS	5	5	--	--	0	1
TROPICAL STORMS	6	11	--	--	0	1
TYPHOONS/HURRICANES	14	19	--	--	0	1
I.O. TROPICAL CYCLONES	--	--	6	3	--	--
TOTAL TROPICAL CYCLONES	25	41	6	3	0	3

*BAY OF BENGAL ONLY (DOES NOT INCLUDE ARABIAN SEA)


PACIFIC AREA
TROPICAL STORMS & DEPRESSIONS
TD-02 23 APR - 28 APR
MAMIE 27 JUL - 29 JUL
TD-05 06 AUG - 07 AUG
SUSAN 26 AUG - 27 AUG
29 AUG - 01 SEP
VIOLA 05 SEP - 07 SEP
DORIS 03 OCT - 06 OCT
TS SUSAN #09
TS MAMIE #03
TS VIOLA #11
TS DORIS #16
TD-05
TD-02
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
SAIGON
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
PONAPE


PACIFIC AREA
TROPICAL STORMS & DEPRESSIONS
TD-18 15 OCT - 17 OCT
GRACE 25 OCT - 02NOV
HELEN 03NOV- 04NOV
TD-24 27DEC - 28DEC
TD-25 27DEC - 29DEC
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TS GRACE #20
TS HELEN #21
TD-18
TD-24
TD-25
02/06Z
25/00Z
17/06Z
16/06
04/12Z
03/06Z
28/00Z
27/00Z
29/00Z
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
SAIGON
SINGAPORE
IWO JIMA
CHICHI JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK


PACIFIC AREA TYPHOONS
LOLA 22 JAN - 28 JAN
NINA 31 JUL - 04 AUG
ORA 10 AUG - 12 AUG
PHYLLIS 12 AUG - 18 AUG
RITA 18 AUG - 23 AUG
TESS 02 SEP - 10 SEP
WINNIE 09 SEP - 12 SEP
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
LOLA
NINA
ORA
PHYLLIS
RITA
TESS
WINNIE
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
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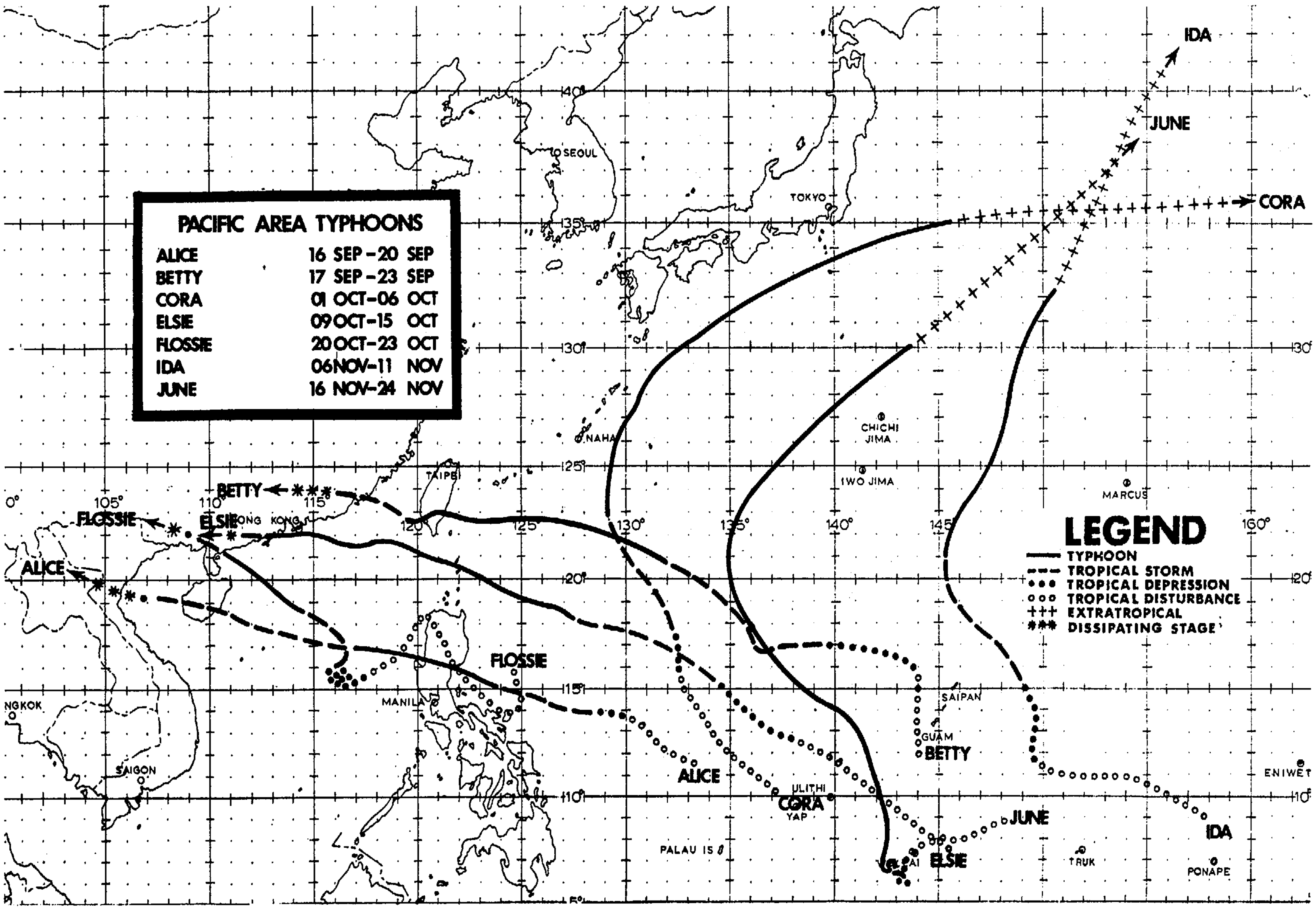
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KUSAIE
WAKE
TARAWA


PACIFIC AREA TYPHOONS
ALICE 16 SEP - 20 SEP
BETTY 17 SEP - 23 SEP
CORA 01 OCT - 06 OCT
ELSIE 09 OCT - 15 OCT
FLOSSIE 20 OCT - 23 OCT
IDA 06 NOV - 11 NOV
JUNE 16 NOV - 24 NOV
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
IDA
JUNE
CORA
BETTY
FLOSSIE
ELSIE
ALICE
SEOUL
TOKYO
NAHA
TAIPEI
MANILA
SAIGON
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
TRUK
PONAPE
ENIWET
105°
110°
115°
120°
125°
130°
135°
140°
145°
160°
40°
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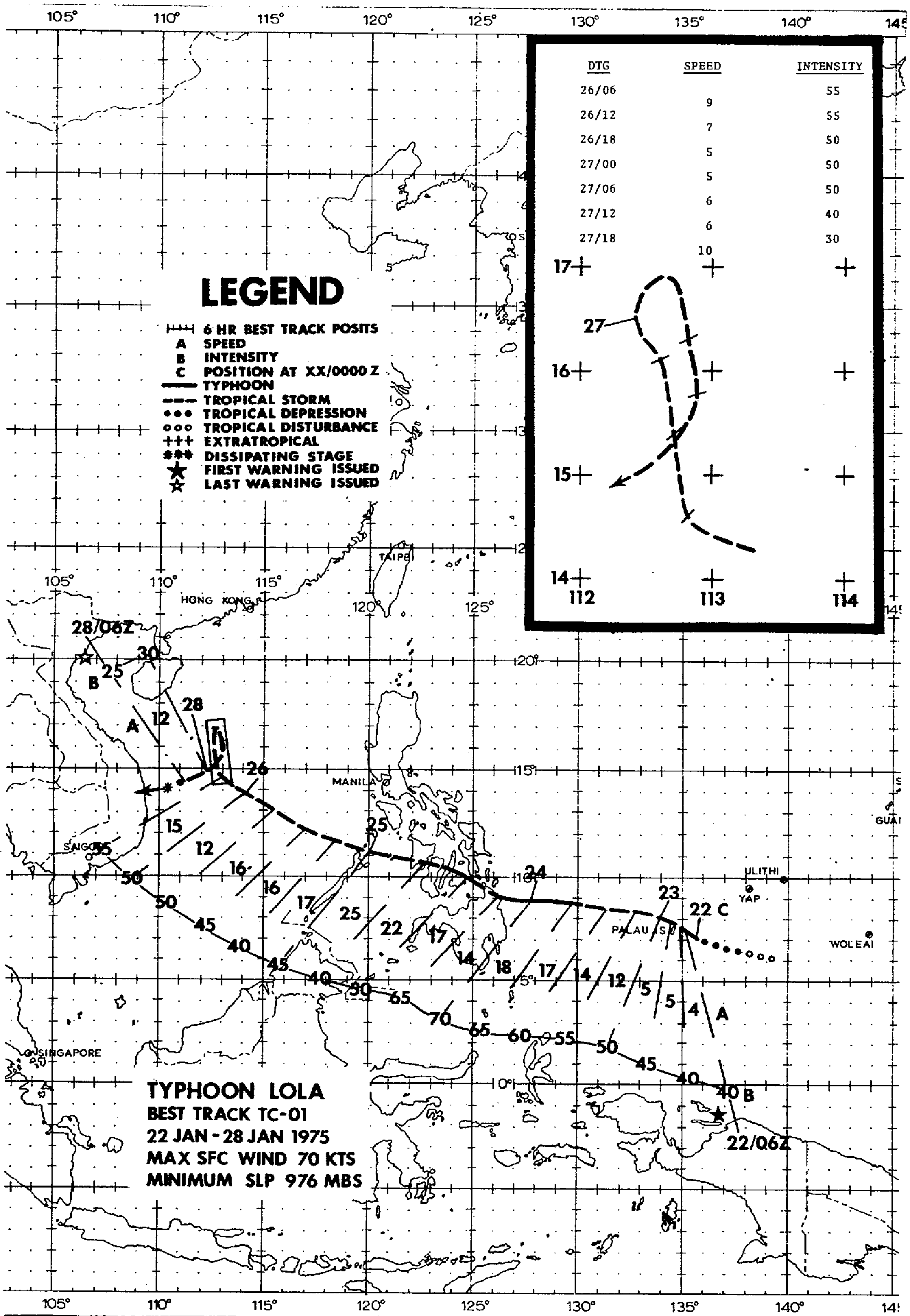
30°
25°
20°
15°
10°
5°


LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
DTG
SPEED
INTENSITY
26/06
55
9
26/12
55
7
26/18
50
5
27/00
50
5
27/06
50
6
27/12
40
6
27/18
30
10
TYPHOON LOLA
BEST TRACK TC-01
22 JAN - 28 JAN 1975
MAX SFC WIND 70 KTS
MINIMUM SLP 976 MBS
HONG KONG
TAIPEI
MANILA
SAIGON
SINGAPORE
ULITHI
YAP
WOLEAI
PALAU IS
GUAM
28/06Z
22/06Z
22 C

In mid-January, the monsoon trough, normally located south of 5N during this time of year, moved northward. A circulation was first detected in the trough on 18 January approximately 400 nm south of Guam. Over the next five days this tropical disturbance was to develop into Typhoon Lola. Lola was distinguished by being only the ninth typhoon in the month of January since 1945.

From its origin, the circulation tracked west-northwest as it intensified to tropical storm strength on 22 January. At that time Lola was 75 nm east of the Palau Islands with northwesterly winds of 35 kt observed on Koror. Wind, rain, and high seas from Lola lashed the Palau Islands for the next 24 hr as the storm moved through. Major damage to agriculture occurred on the northernmost island of Kayangel, with banana, papaya, coconut, and taro crops nearly totally destroyed.

From the Palau Islands, Lola tracked west under the steering influence of strong 500 mb ridging to the north. With upper-level outflow restricted in the eastern semicircle by strong ridging to the east, Lola developed to minimal typhoon strength late on the 23rd. Aircraft reconnaissance reports on the 24th indicated the typhoon's central pressure had reached its minimum of 976 mb (Fig. 4-1).

Typhoon Lola struck the central Philippines' sugar producing provinces near peak intensity on the afternoon of the 24th. At least 30 persons were reported killed by landslides and flying debris, with more than 300 houses in the coastal town of Tandog destroyed by the storm surge.

Lola decreased to tropical storm strength while crossing the Philippines and entered the South China Sea. The storm then pursued a west-northwest track as the 500 mb ridge receded eastward. Lola regenerated to a peak intensity of 50 kt on the morning of the 26th. By the following morning, a cold frontal surge from Asia pushed into the South China Sea, weakening the circulation significantly. The remains of Lola moved southward in response to the building high pressure to the north. The final warning was issued on the 28th, when satellite data indicated that the upper-level anticyclone had sheared off, and the remains of the surface circulation had drifted southward.

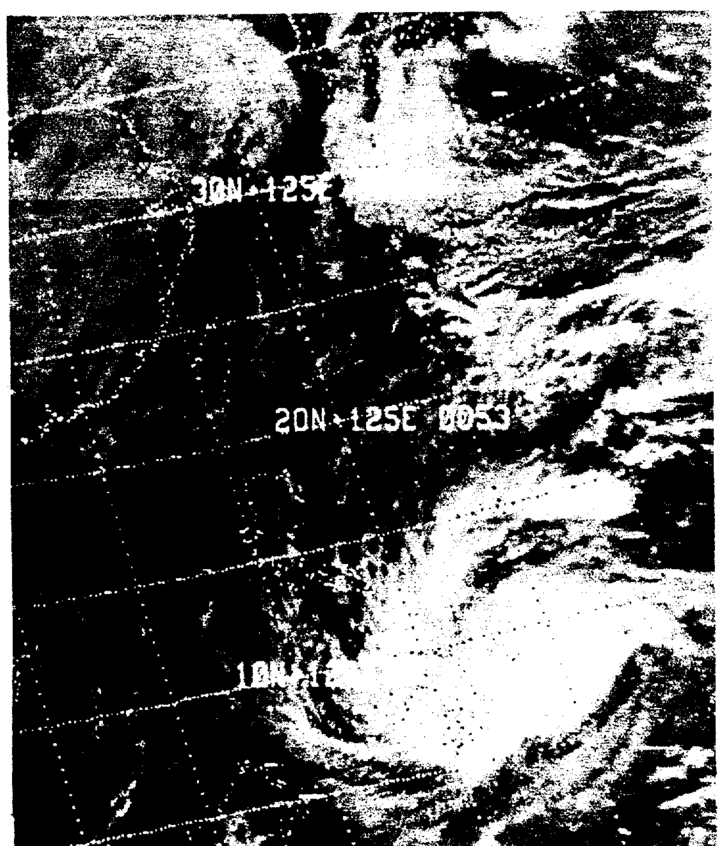
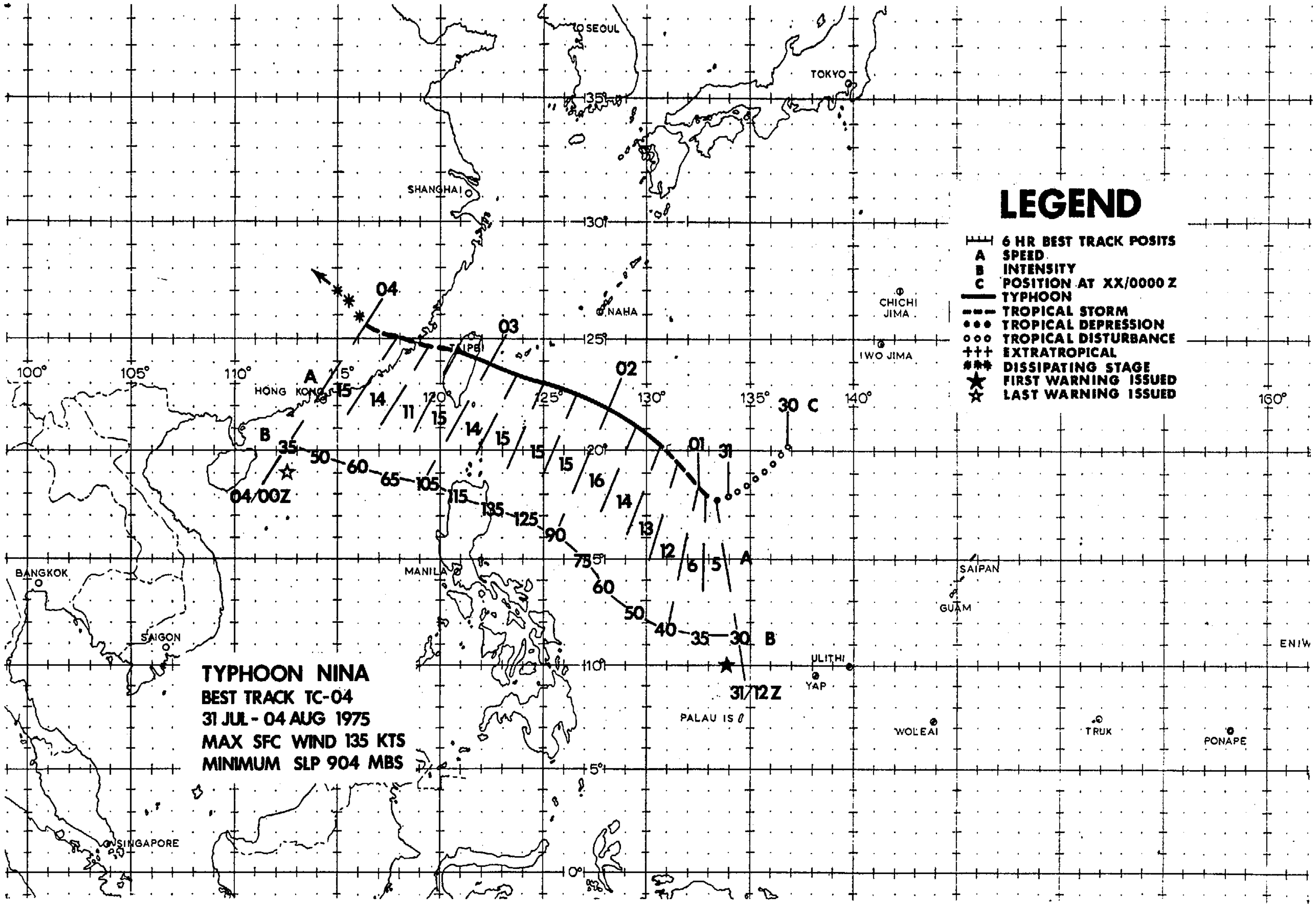


FIGURE 4-1. *Typhoon Lola near peak intensity 90 nm east of northern Mindanao, 24 January 1975, 0056Z. (NOAA-4 imagery)*


TYPHOON NINA
BEST TRACK TC-04
31 JUL - 04 AUG 1975
MAX SFC WIND 135 KTS
MINIMUM SLP 904 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
HONG KONG
BANGKOK
MANILA
SAIGON
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIW
SINGAPORE
04/00Z
31/12Z
04
03
02
01
31
30 C
A
B

As Tropical Storm Mamie dissipated and drifted toward Korea, the monsoon trough migrated northward leaving a well-defined trough line extending southeastward from the remains of Mamie into the Philippine Sea. A tropical disturbance spawned in this trough near 20N 137E on 29 July and rapidly developed into Typhoon Nina, one of the most destructive storms of the 1975 season.

After initial detection by satellite and classification as a tropical disturbance, T.D. 04 moved southwestward for approximately 36 hr as surface and upper-air circulations became organized and vertically aligned. By 1200Z on the 31st the system slowed, intensified rapidly to tropical storm strength, and began turning to the northwest (Fig. 4-2). As the storm made this turn, it responded to mid-tropospheric steering flow and accelerated along the equatorward periphery of the 500 mb subtropical ridge. Continued building of the subtropical ridge to the west forced Nina to take a west-northwesterly track toward Taiwan just prior to reaching typhoon intensity on 1 August.

Nina underwent explosive deepening late on 1 August. Aircraft reconnaissance data indicated a 63 mb drop in sea level pressure at the typhoon center between the 1st at 1437Z and the 2nd at 0830Z, with maximum surface winds increasing from 65 kt to 130 kt during that period. An overhead pass by a DMSP satellite gave a particularly striking view of the typhoon as it was undergoing rapid deepening (Fig. 4-3). A peak intensity of 135 kt was attained on the 2nd at 1200Z, approximately 200 nm east of Taiwan. The typhoon slowly decreased in intensity while approaching the island, making landfall near the coastal city of Hualien on the 3rd at 0300Z with maximum surface winds of 100 kt.

Much of the typhoon's strength was lost as it battered across Taiwan's central mountain range, fortunately sparing the most populous areas from the more intense winds near the eye. Nevertheless, Nina's trek across Taiwan reportedly left 25 people dead, 4 missing and 168 injured. It was also reported that over 3,000 homes were at least partially collapsed, 39 fishing boats were sunk, and a 16,000 ton Korean freighter, THE SUN STAR, was capsized near Koahsiung harbor. Damage from flooding and landslides was widespread.

Nina entered the Formosa Straits with minimal typhoon strength, and weakened to approximately 60 kt before striking the China mainland on the 3rd at 1500Z. Nina moved inland and lost tropical cyclone characteristics on the 4th of August.

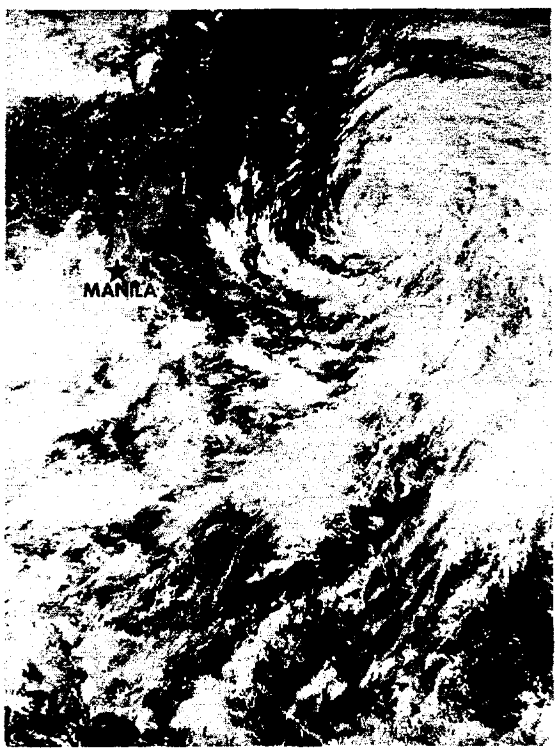
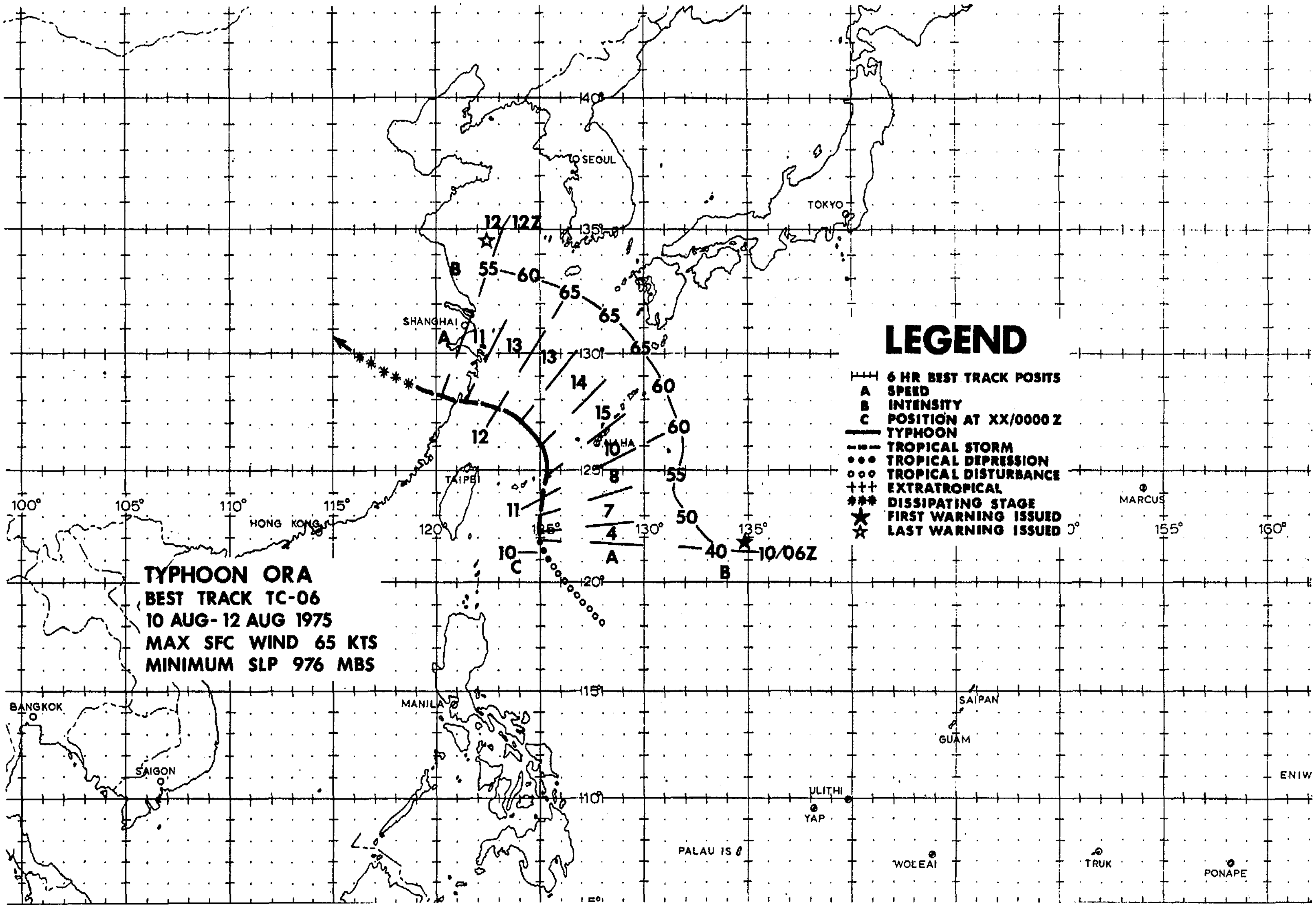


FIGURE 4-2. *Nina achieving tropical storm strength in the Philippine Sea 675 nm east-northeast of Manila, 31 July 1975, 2356Z. (DMSP imagery)*

FIGURE 4-3. *Direct overhead photograph illustrating concentric wall clouds of Typhoon Nina during explosive deepening 235 nm south of Okinawa, 2 August 1975, 0332Z. (DMSP imagery)*


TYPHOON ORA
BEST TRACK TC-06
10 AUG-12 AUG 1975
MAX SFC WIND 65 KTS
MINIMUM SLP 976 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
10/06Z
12/12Z
SEOUL
TOKYO
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
BANGKOK
SAIGON
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIW

The third typhoon of the season, Ora, was small and short lived. Ora first appeared as a weak circulation in the near equatorial trough (drawn north by the influence of Typhoon Nina and T.D. 05) during the evening of the 8th. During the next 30 hr, this weak circulation moved northwestward at 6 kt showing little intensification.

On the morning of the 10th, a rapidly moving upper-level trough in the mid-latitude westerlies was located to the northwest of the circulation. This trough provided a highly efficient high altitude outflow channel which allowed Ora to grow from a tropical depression (Fig. 4-4) into a typhoon within 30 hr. As this trough moved quickly toward the east, Ora responded with a north-northeastward movement. When Ora's eye passed over Miyako Jima at 0600Z on the 11th, (Fig. 4-5) the weather station recorded 5 kt surface winds and a minimum pressure of 976 mb. Simultaneously, a ship (JL 11) 120 nm to the east reported 55 kt sustained winds. At 0749Z on the 11th, 50 kt gusts were recorded at Kadena AB, Okinawa, 150 nm northeast of Ora. As the trough passed to the east, the subtropical high over central China built rapidly eastward and Ora shifted northwestward and accelerated to 15 kt. By the morning of the 12th, Ora had turned westward at 13 kt until landfall was made on the 12th at 0800Z near Yung-chia on the central China coast.

From 0000Z on the 11th, until striking the China coast, Ora maintained typhoon strength winds of 65 kt. A surface high pressure cell moving eastward from the sea of Japan into the North Pacific, rendered Ora a highly asymmetric storm with 30 kt winds extending 300 nm to the northeast and only 150 nm to the southwest. Although little destruction was directly attributed to Ora, monsoon rains were spawned over the Philippines and caused widespread flooding and landslides. Choppy waters near Tocloban, Leyte capsized a crowded motorboat leaving 15 dead and 30 missing.

FIGURE 4-4. *Ora attaining tropical storm intensity 190 nm south of Miyako Jima with upper level trough to the west, 10 August 1975, 0033Z. (DMSP imagery)*

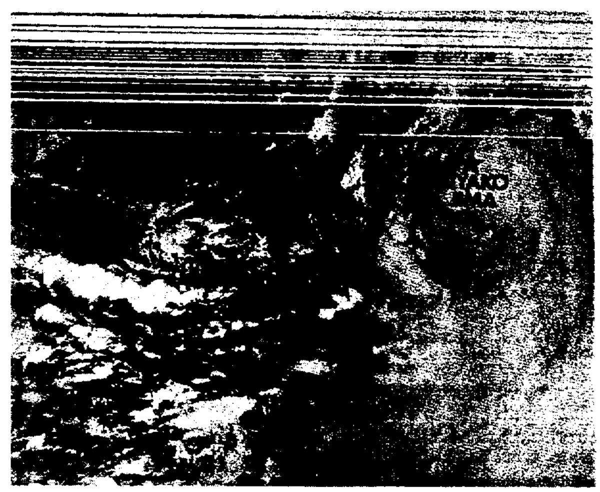
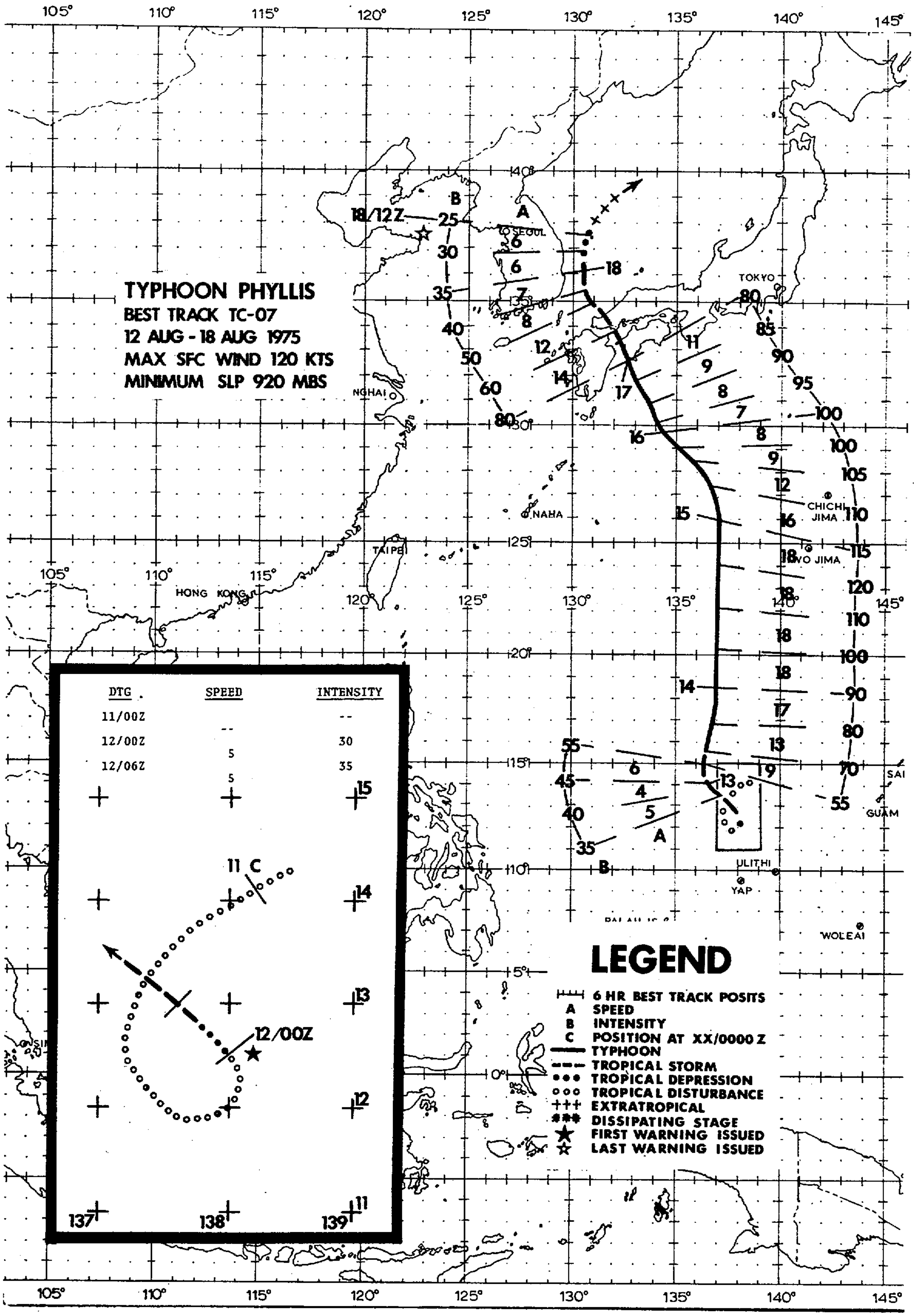


FIGURE 4-5. *Tropical Storm Ora 60 nm south of Miyako Jima just prior to reaching typhoon intensity, 11 August 1975, 0015Z. (DMSP imagery)*


TYPHOON PHYLLIS
BEST TRACK TC-07
12 AUG - 18 AUG 1975
MAX SFC WIND 120 KTS
MINIMUM SLP 920 MBS
DTG
SPEED
INTENSITY
11/00Z
12/00Z
12/06Z
5
5
30
35
12/00Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
NAHA
TAIPEI
HONG KONG
CHICHI JIMA
IWO JIMA
ULITHI
YAP
WOLEAI
GUAM
18/12Z

Since early August, the monsoonal trough had extended from the remains of Typhoon Nina in central China to an area west of Guam. A number of surface circulations appeared in this trough as early as the 8th of August, but it was not until the morning of the 11th that Phyllis first appeared as a tropical disturbance some 380 nm west-southwest of Guam.

The first warning on what was to become the fourth typhoon of 1975, was issued on the morning of the 12th. Aircraft reconnaissance located T.D. 07 395 nm west-southwest of Guam with center winds of 30 kt. At 0600Z on the 12th, the depression was upgraded to a 35 kt tropical storm. Aircraft reported multiple surface centers and a weak and diffuse 700 mb center.

Initially, the upper-level anticyclone was located 110 nm west of the surface center. However, by the morning of the 13th the upper and lower levels had become vertical. On the 13th at 0833Z, aircraft reported a closed wall cloud with an eye 30 nm in diameter. A Russian research vessel (EREC), reported surface winds of 60 kt 60 nm west-southwest of Phyllis at 1200Z on the 13th; thus, Phyllis was upgraded to typhoon with maximum winds of 70 kt.

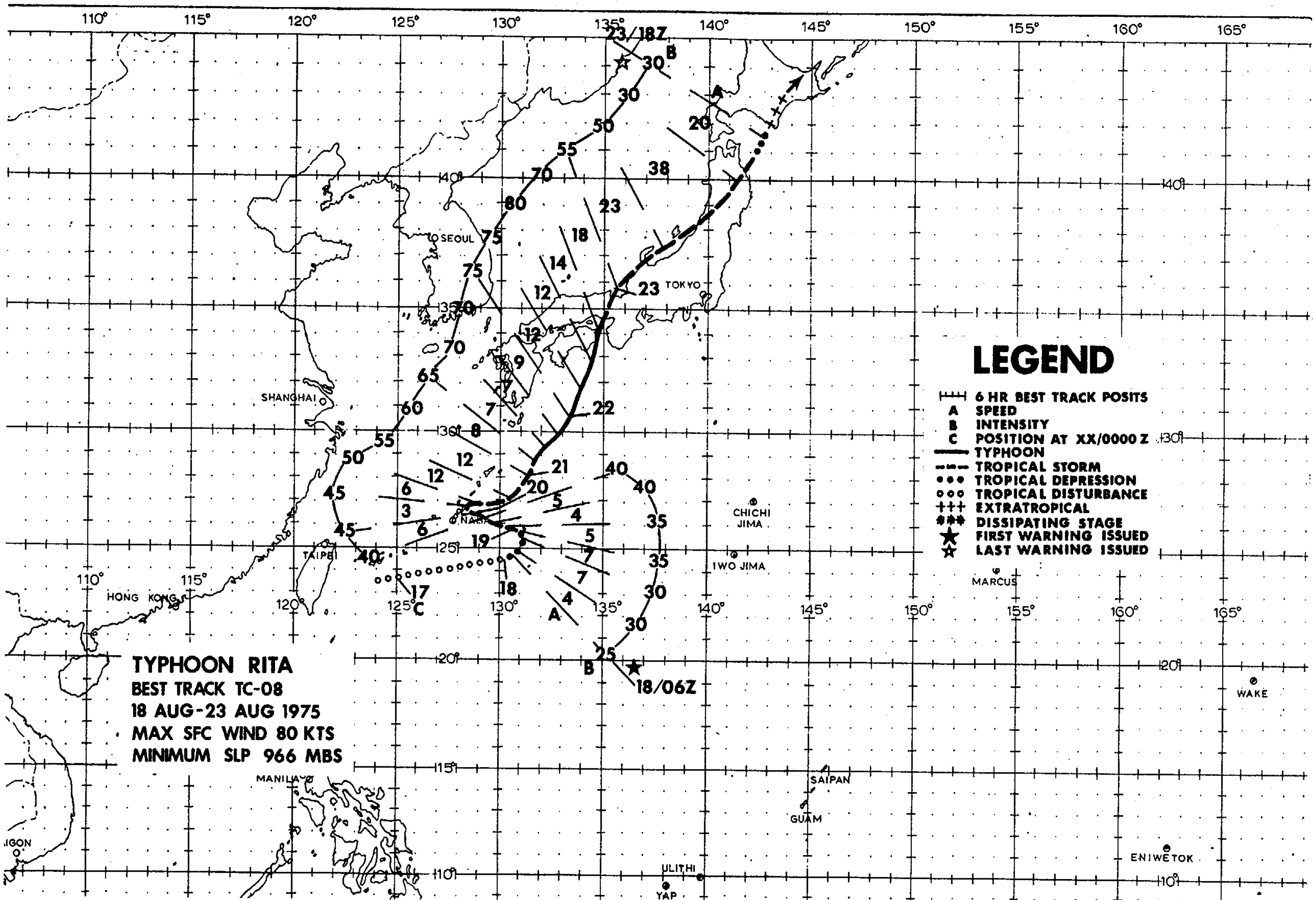
By the 13th the mid-tropospheric ridge over China began to weaken while the ridge east of Japan intensified. Twenty-four hours later, Phyllis' forward speed had increased to 18 kt (Fig. 4-6). The typhoon attained a maximum intensity of 120 kt on the 14th at 1800Z after aircraft had recorded a minimum sea level pressure of 920 mb at 1505Z (Fig. 4-7). By the 15th, Phyllis' movement had slowed to 7 kt, and had become northwestward as the mid-tropospheric ridge built westward across Japan.

After turning to the northwest, Phyllis once again accelerated, and by the afternoon of the 16th, was located 165 nm southeast of the Japanese Island of Shikoku. As Phyllis approached Japan, Shimizu (WMO station 47898, elev 99 ft), recorded sustained surface winds of 77 kt on the 16th at 1800Z and a minimum pressure of 970 mb at 2300Z. Murotomisaki (WMO station 47899, elev 606 ft), recorded sustained surface winds of 73 kt at 2000Z on the 16th. Phyllis, with 80 kt sustained winds, made landfall during the morning of the 17th near the southwestern edge of Shikoku.

In her wake Phyllis left extensive damage and loss of life. On Shikoku alone there were at least 60 dead, 146 injured, and 12 missing due to the combination of heavy rains, flooding and numerous landslides. At least 489 houses were reported collapsed, 577 damaged, 58 washed away and thousands inundated. Phyllis passed 20 nm to the west of Iwakuni MCAS which reported maximum gusts of 38 kt.

FIGURE 4-6. *Typhoon Phyllis in the Philippine Sea with 90 kt intensity, 13 August 1975, 2320Z. (DMSP imagery)*

FIGURE 4-7. *Typhoon Phyllis near peak intensity 230 nm west of Iwo Jima, 14 August 1975, 2302Z. (DMSP imagery)*


TYPHOON RITA
BEST TRACK TC-08
18 AUG-23 AUG 1975
MAX SFC WIND 80 KTS
MINIMUM SLP 966 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
23/18Z
18/06Z
SEOUL
SHANGHAI
TOKYO
TAIPEI
HONG KONG
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
MANILA
SAIPAN
GUAM
ULITHI
YAP
ENIWETOK

The third typhoon in August, Rita, made landfall in Japan closely following the wake of Typhoon Phyllis. Due to heavy rains brought by Rita, the storm proved to be the most damaging to affect the northern Japanese islands since 1965.

The typhoon's birth can be traced to the development of a monsoon depression some 180 nm southeast of Okinawa on the 18th. Drifting first east then westward, Rita began to gain strength as aircraft reconnaissance reports verified storm force winds in the circulation on the following day. Due to a weakening subtropical high cell east of Japan, heights began to fall north of Rita. In response, the storm reversed track to an easterly direction a few miles off the northern tip of Okinawa. A minimum pressure of 983.4 mb was registered at Kadena Air Base on the 20th at 0620Z although winds were comparatively light with a peak gust of 37 kt from the northwest recorded at 0514Z.

An approaching short wave over Manchuria began to draw Rita on a more northward course late on the 20th (Fig. 4-8). By the afternoon of the 21st, typhoon force winds were reached and Rita's circulation had grown significantly in size. Due to the building pressure gradient associated with the high cell east of Japan, gale force winds extended some 300 nm in the typhoon's eastern semicircle. As the short wave continued to approach the typhoon, Rita accelerated gradually in a north-northeasterly direction, making landfall 30 nm west of Osaka late on the 22nd (Fig. 4-9). Prior to landfall, Rita's 40-60 nm diameter eye passed over Murotomisaki (WMO station 47899, elev 606 ft), Shikoku. The station experienced a pressure reading of 966.3 mb at 1200Z and sustained surface winds of 80 kt.

Quickly crossing central Honshu, Rita veered slightly and accelerated to speeds of 30-35 kt ahead of an advancing cold front in the Sea of Japan. First tracking along the western coast, Rita crossed the northern portion of Honshu, finally emerging back into the Pacific on a northeasterly heading. Strong gusty winds occurred along the exposed southern coast of Honshu between the Kii and Boso peninsulas. Southerly winds gusting near 55 kt were recorded at Yokota Air Base between 0300Z and 0400Z on the 23rd.

Merging with the frontal zone south of Hokkaido, Rita continued to track northeastward as an extratropical low. Torrential rains swept Hokkaido with amounts totaling near 8.2 inches in 24 hr. Landslides and flash flooding as a result of the rains were responsible for extensive crop and property damage with farmlands inundated and 36,000 houses flooded throughout Japan. At least 26 deaths were attributed to the typhoon. Newspaper reports indicate that it was the worst flooding in 10 years for Hokkaido. Several major rivers on the island overflowed their banks leaving towns marooned and isolated.

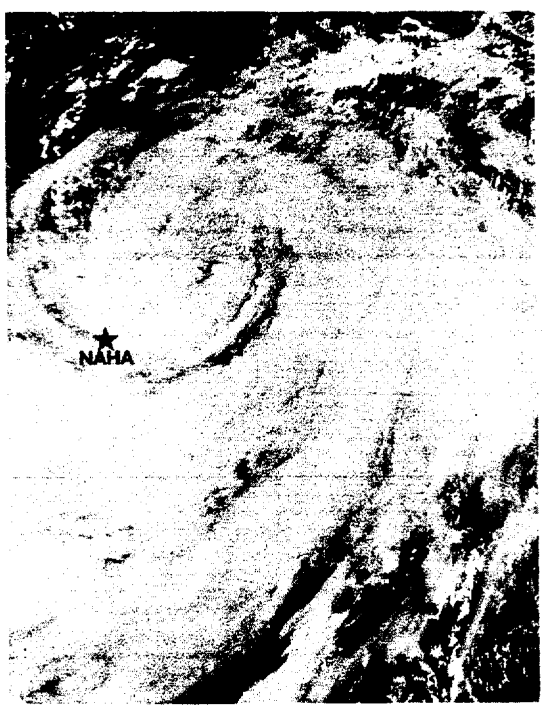


FIGURE 4-8. *Rita as a 60 kt tropical storm 190 nm northeast of Okinawa, 20 August 1975, 2253Z. (DMSP imagery)*

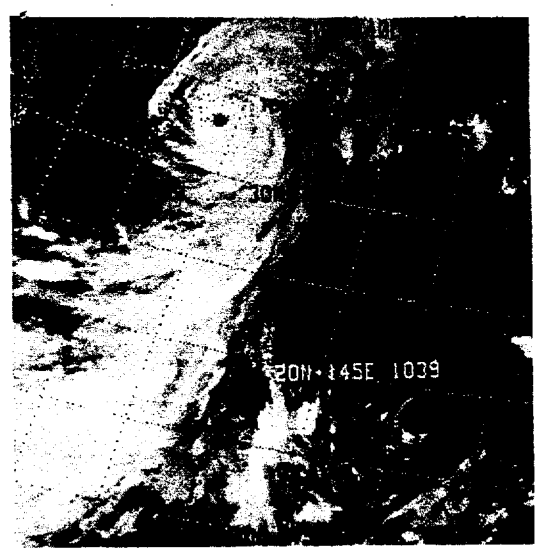
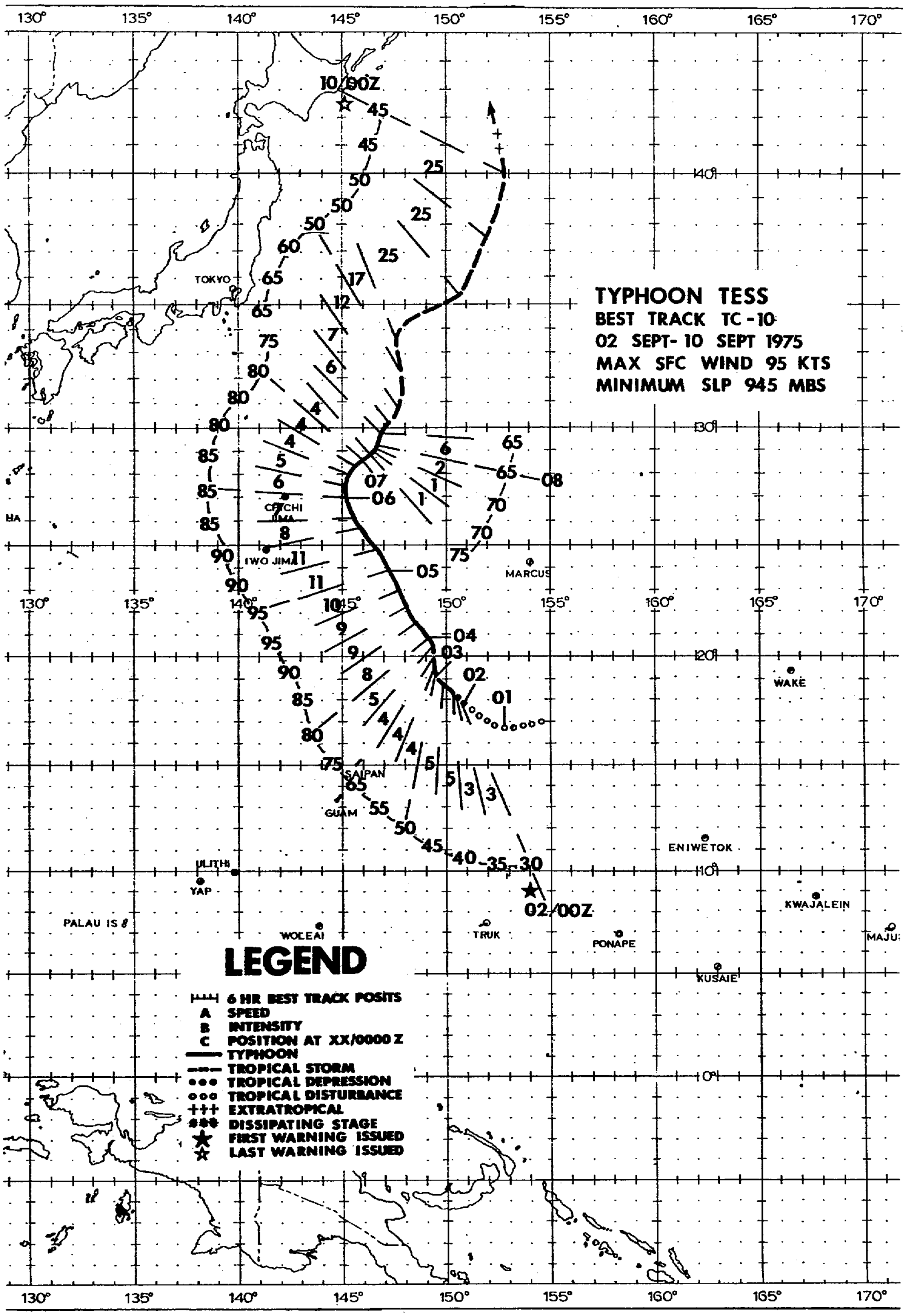


FIGURE 4-9. *Infrared photograph of Typhoon Rita just prior to landfall in Japan, 22 August 1975, 1843Z. (NOAA-4 imagery)*


TYPHOON TESS
BEST TRACK TC-10
02 SEPT-10 SEPT 1975
MAX SFC WIND 95 KTS
MINIMUM SLP 945 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
10/00Z
02/00Z
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KWAJALEIN
KUSAIE
130°
135°
140°
145°
150°
155°
160°
165°
170°

Satellite data on the evening of 31 August first showed preliminary upper-level features indicative of a formative outflow pattern. Divergent flow on the southern side of the persistent tropical upper tropospheric trough (TUTT) was enhancing the tropical cyclone formation process and a closed surface circulation was analyzed in the same area the following morning, 600 nm east-northeast of Saipan. Mid-tropospheric ridging from Japan to the Dateline initially caused Tess' embryo to drift west-southwest. As this ridge weakened, the system began tracking west-northwest, developing slowly. As the TUTT migrated toward the north, an anticyclone was established over the surface circulation, which was now located 280 nm east of Pagan Island in the northern Mariana Islands.

The first warning on Tess was issued on the morning of 2 September after reconnaissance aircraft and satellite data indicated rapid development. Tess was upgraded to a typhoon on the 3rd at 1200Z when reconnaissance aircraft reported surface winds of 75 kt approximately 250 nm west of the Maug Islands. The typhoon was now moving in a more northerly direction toward a weakness in the collapsing mid-tropospheric ridge to the north. Thirty hours later on the 4th at 1800Z, Tess reached a minimum central pressure of 945 mb and maximum sustained surface winds of 95 kt.

Tropical Storm Viola had formed approximately 1200 nm southwest of Tess on the 4th and subsequently moved within 900 nm of Tess before dissipating on the 7th (Fig. 4-10). Viola's presence helps explain Tess' reduced speed of movement and irregular track during this period. On the 7th at 0000Z, the SS OREGON reported estimated surface winds of 65 kt while 60 nm east-southeast of the storm's center (Fig. 4-11). Tess maintained typhoon intensity until the 8th at 1800Z, when it moved into a hostile environment of colder water and began interacting with an approaching frontal system. Satellite data indicated that the typhoon was becoming extratropical, and by the morning of the 10th Tess had merged into the frontal system.

The entire life time of Tess was spent between 153E and 145E, an area of the western North Pacific having few populated islands. This system did little if any damage during its ten day lifespan.

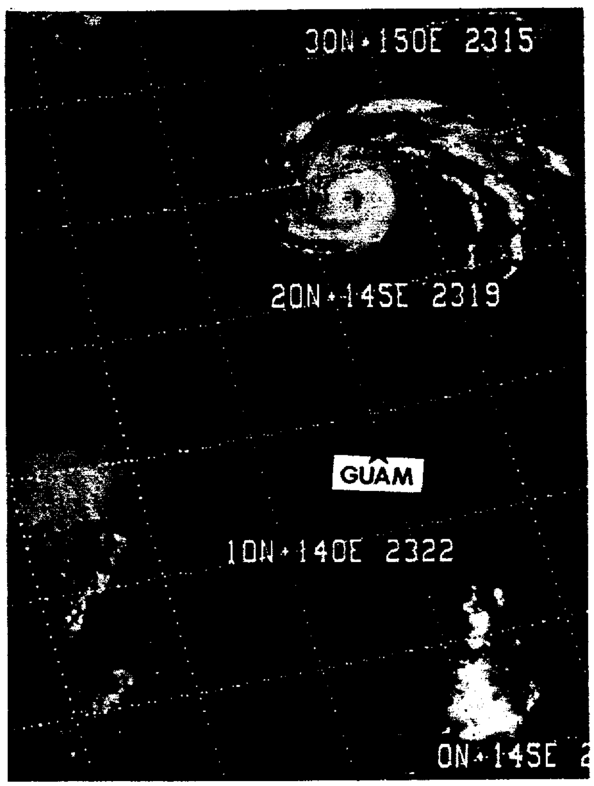


FIGURE 4-10. *Typhoon Tess 620 nm north-northeast of Guam. Tropical Depression 11, which developed into Tropical Storm Viola, can be seen approximately 850 nm to the southwest of Tess, 4 September 1975, 2317Z. (NOAA-4 imagery)*

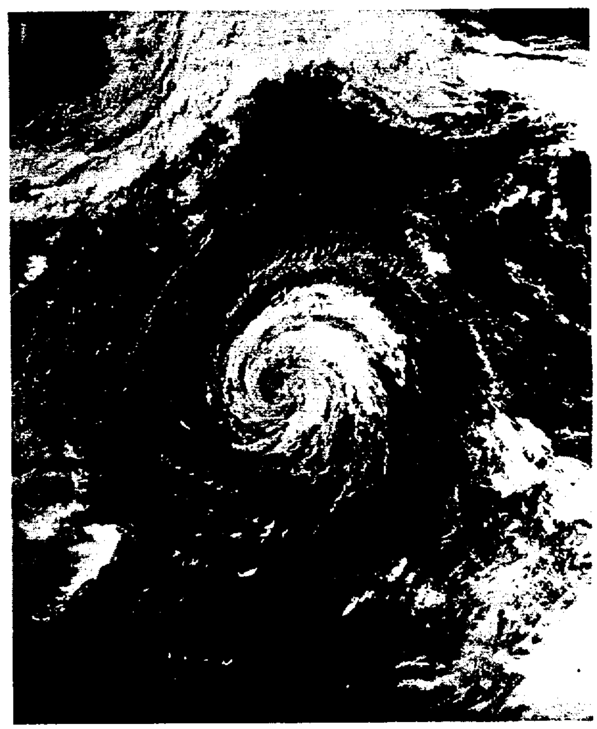
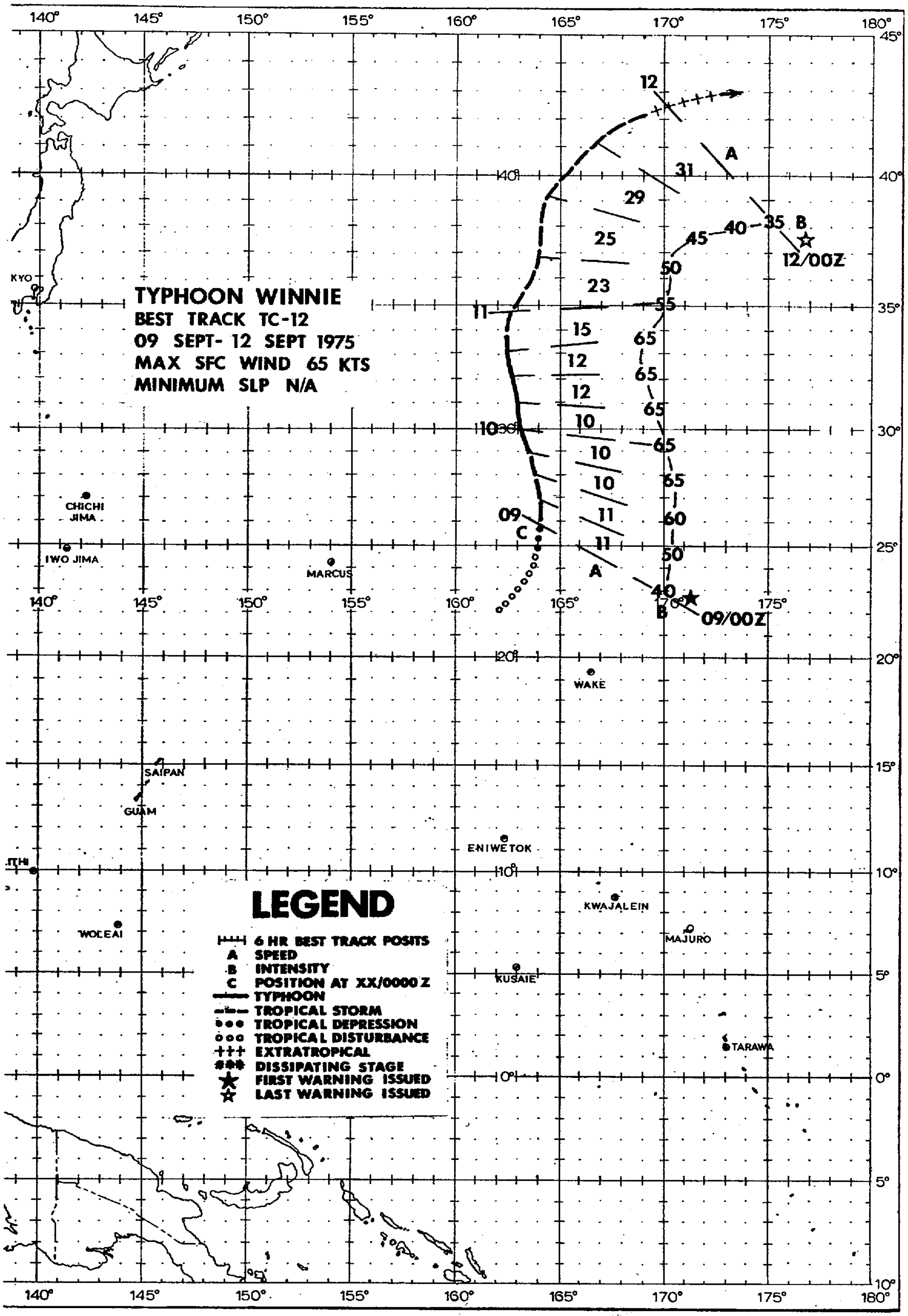


FIGURE 4-11. *Typhoon Tess 265 nm east-northeast of Chichi Jima, 7 September 1975, 2227Z. (DMSP imagery)*


TYPHOON WINNIE
BEST TRACK TC-12
09 SEPT- 12 SEPT 1975
MAX SFC WIND 65 KTS
MINIMUM SLP N/A
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
09/00Z
12/00Z
KYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ENIWETOK
KWAJALEIN
MAJURO
WOLEAI
KUSAIE
TARAWA

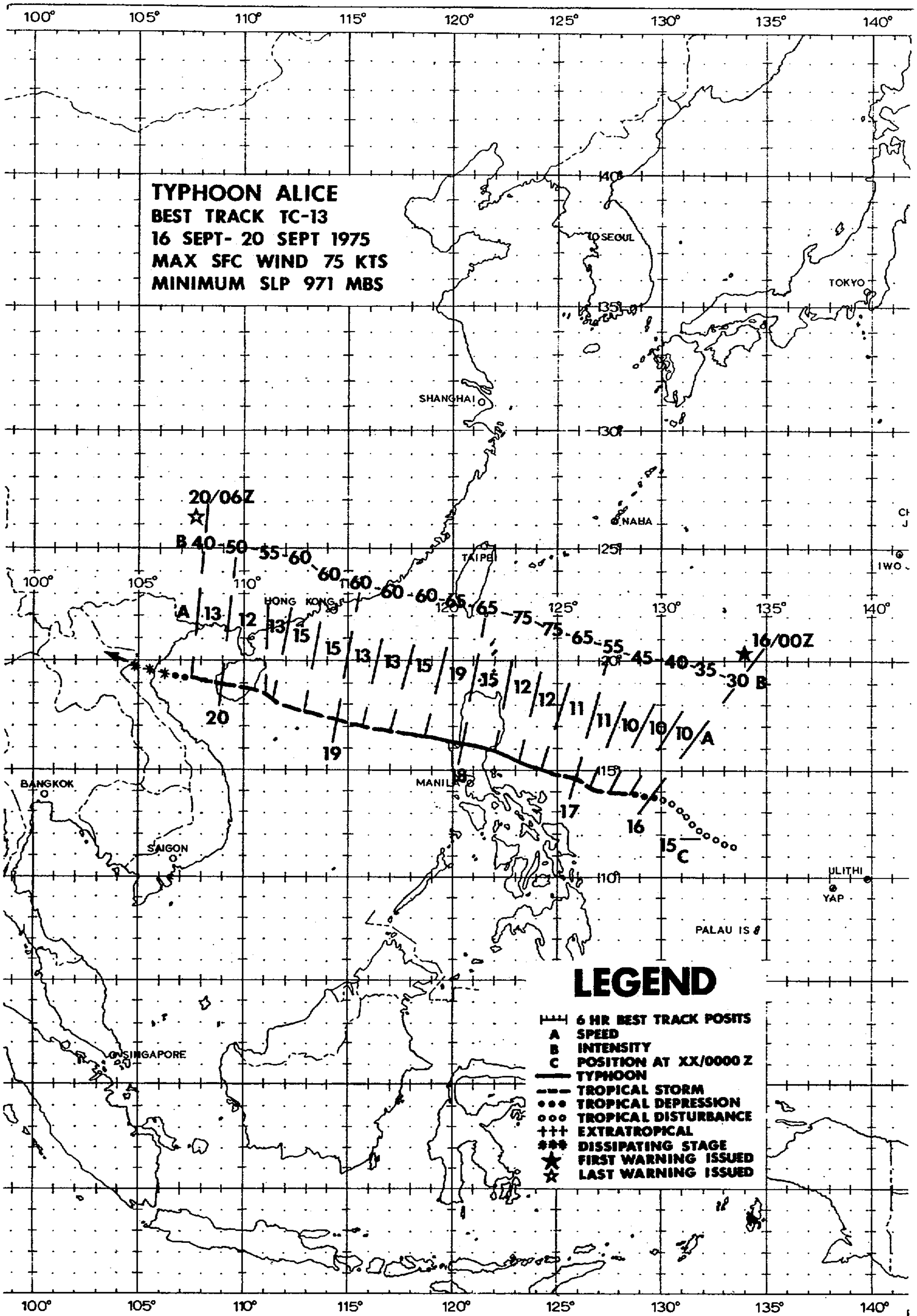
Winnie was first detected by satellite on 5 September as a weak tropical disturbance approximately 300 nm northwest of Wake Island. At this time Typhoon Tess was approximately 900 nm to the northwest of Winnie with a surface trough extending southeastward to Wake Island. The combination of surface troughing and a favorable upper air pattern allowed this disturbance to develop. The first warning was issued early on the morning of the 9th based on satellite data.

From her initial detection as a disturbance, Winnie moved slowly north-northeastward, attaining minimal tropical storm intensity at 2100Z on the 8th. The storm was now 400 nm north-northwest of Wake Island and posed no significant threat to any inhabited islands. However, as reported by the Pacific Stars and Stripes, Winnie did represent a threat to shipping and in fact sank a 44 ft sailboat, THE FLATBUSH MAN, on a pleasure cruise from Marcus Island to Hawaii. The four people aboard were adrift for 13 days in a rubber raft until 21 September when a Russian whaling vessel picked them up.

From the time of initial tropical storm strength until 1200Z on the 11th, Winnie was steered on a northerly course by the combination of a sharp mid-tropospheric trough to the west and a blocking ridge to the east. A 200 mb trough extending to the west of Winnie inhibited development past minimal typhoon strength with typhoon force winds persisting only for a 24 hr period from 1800Z on the 9th to 1800Z on the 10th (Fig. 4-12). A Japanese ship (JEEU), located approximately 35 nm north of Winnie, reported sustained winds of 65 kt at 1800Z on the 9th.

Approaching a frontal system near 35N, Winnie came under stronger steering flow, accelerated to near 20 kt, and began to weaken. A short wave trough moving through the long wave ridge diminished its amplitude and Winnie assumed a more northeasterly track while continuing to accelerate. By 0000Z on the 12th, Winnie was absorbed into the frontal system and became an extratropical system with maximum winds of 30 kt.

FIGURE 4-12. *Typhoon Winnie 650 nm north-northwest of Wake Island, 9 September 1975, 2151Z. (DMSP imagery)*



TYPHOON ALICE
BEST TRACK TC-13
16 SEPT- 20 SEPT 1975
MAX SFC WIND 75 KTS
MINIMUM SLP 971 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
20/06Z
16/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
SAIGON
SINGAPORE
ULITHI
YAP
PALAU IS
IWO

On 11 September, the TUTT extended westward across the western North Pacific into the South China Sea with several cyclonic cells apparent along the trough axis. On the morning of the 12th, a tropical disturbance was identified on satellite data to the south of the TUTT, near 12N 148E. Outflow weakened over the disturbance as the TUTT moved to the northwest rendering upper-level divergence insufficient to induce a surface vortex and stimulate further development. The anticyclone drifted westward with little apparent change until the 15th, when it moved over a small vortex in the monsoon trough near 13N 131E. As this upper-level anticyclone became vertically aligned over the surface cyclone, the system underwent rapid tropical cyclone development.

This system became Tropical Storm Alice on the afternoon of the 16th and intensified to typhoon strength within 24 hr (Fig. 4-13). On the 17th at 1430Z, aircraft reconnaissance data indicated a 32 mb drop in central pressure during the previous 21 hr, and maximum flight level winds of 105 kt were recorded on this eye penetration.

Reduced inflow resulting from the development of Typhoon Betty (1200 nm to the east) inhibited further development as Alice approached central Luzon. At 2000Z on the 17th the typhoon made landfall near Casiguran, Luzon with maximum surface winds of 75 kt.

Alice passed Luzon near 16N, and entered the South China Sea at 0400Z on the 18th with surface winds of 65 kt (Fig. 4-14). Wallace Air Station reported winds of 40 kt with gusts to 60 kt at 0129Z and a peak gust of 42 kt was recorded at Baguio at 0432Z. No significant damage was reported during the Luzon crossing.

Alice continued to a west-northwest track across the South China Sea in response to moderate steering flow along the southern periphery of the 500 mb subtropical ridge. Maximum surface winds decreased to 60 kt at 1200Z on the 18th and Alice maintained that intensity until just prior to striking the Hainan coast at 1800Z on the 19th. Alice was still well-organized as she entered the Gulf of Tonkin with 50 kt winds, but weakened rapidly thereafter and dissipated upon moving inland over North Vietman.

FIGURE 4-13. *Alice as a 55 kt tropical storm 90 nm east-northeast of Catanduanes Island, 16 September 1975, 2205Z. (DMSP imagery)*

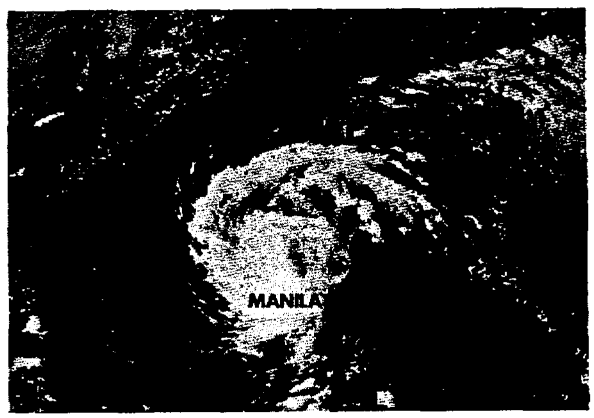
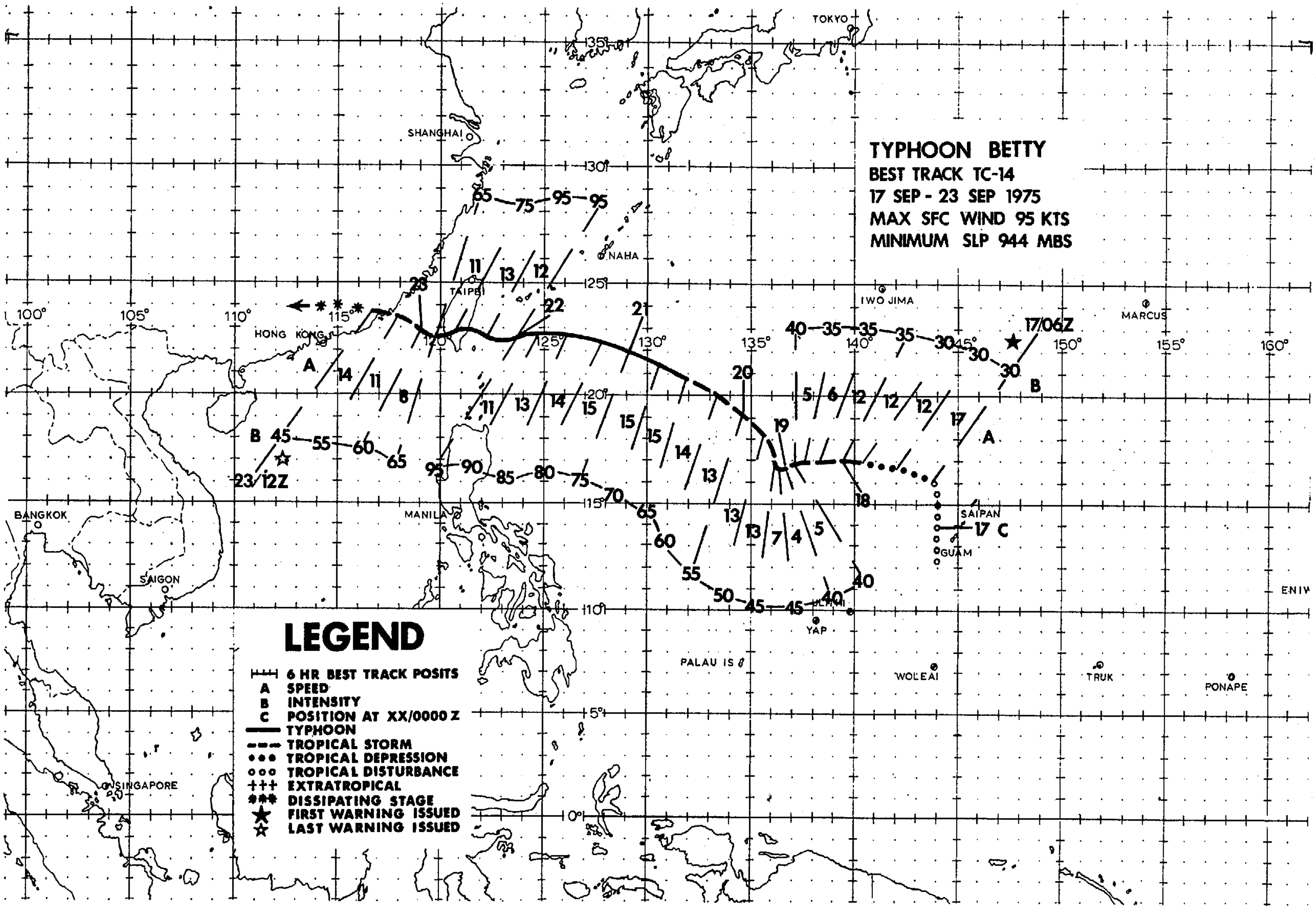


FIGURE 4-14. *Typhoon Alice entering the South China Sea after traversing central Luzon, 18 September 1975, 0411Z. (DMSP imagery)*


TYPHOON BETTY
BEST TRACK TC-14
17 SEP - 23 SEP 1975
MAX SFC WIND 95 KTS
MINIMUM SLP 944 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
IWO JIMA
MARCUS
MANILA
BANGKOK
SAIGON
SAIPAN
GUAM
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
SINGAPORE
ENIW
17/06Z
23/12Z
17 C

As Typhoon Alice approached the Philippine Islands on the 16th of September, another tropical circulation was detected in the monsoonal trough some 200 nm south of Guam. Moving northward at nearly 20 kt, this disturbance passed within 50 nm of Guam early on the 17th. By the afternoon of the 17th the circulation, now T.D. 14, turned sharply to the west as it approached the southern periphery of the subtropical ridge. T.D. 14 attained tropical storm intensity on the morning of the 18th while moving westward at 12 kt.

The subtropical ridge to the west of T.S. Betty was weakened by a series of middle tropospheric short wave troughs. This produced weak steering currents for the storm and the westward movement slowed to 5 kt. By the 19th the subtropical ridge, influenced by Typhoon Alice, intensified and receded to the north. In response, Betty began moving northwestward and accelerated to 13 kt.

On the 19th, as a weak upper tropospheric trough to the west deepened, and created a highly efficient outflow channel to the mid-latitude westerlies, Betty began to intensify (Fig. 4-15). By the 20th, Alice had weakened, allowing the subtropical ridge northwest of Betty to build southward. Betty again responded by moving westward. At 0230Z on the 22nd, Typhoon Betty attained a maximum intensity of 95 kt as reconnaissance aircraft recorded a minimum sea-level pressure of 944 mb. The outflow channel to the north (evident on the 19th) was severed by the 21st (Fig. 4-16), but by then Betty had established an outflow channel to the upper tropospheric monsoon easterlies to the south; thus, Betty continued to intensify until the 22nd.

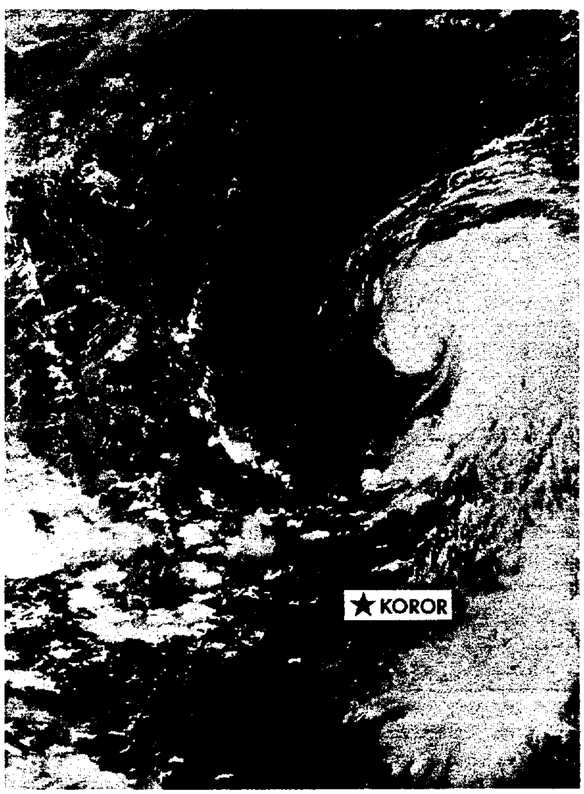


FIGURE 4-15. *Betty as a 55 kt tropical storm in the Philippine Sea 720 nm north of Koror, 19 September 1975, 2352Z. (DMSP imagery)*

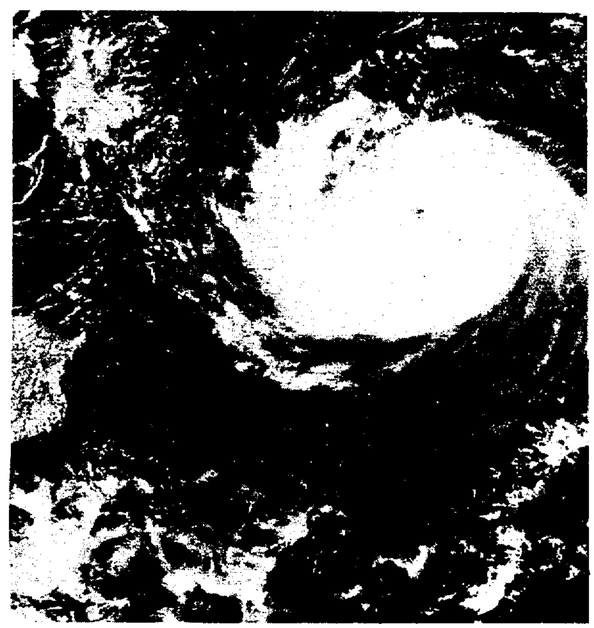


FIGURE 4-16. *Typhoon Betty as she heads toward Taitung, Taiwan 400 nm to the west, 21 September 1975, 0315Z. (DMSP imagery)*

At 1200Z on the 21st, a ship located 140 nm northeast of the storm estimated winds at 55 kt and seas of 27 ft. The 22 September 0000Z rawinsonde at Ishigakishima (110 nm NNE of Betty) showed 70 kt winds from the 3,000 ft through the 18,000 ft level.

The typhoon, when some 120 nm from Taiwan, was placed under constant surveillance by the radar at Hualien, Taiwan (Fig. 4-17). Figures 4-17a and 4-17b enable comparison of the microwave (radar) presentation and the visible (satellite) presentation. Upon reaching Taiwan, Betty began to weaken. The typhoon's track became west-northwestward as the storm interacted with a lee-side trough created by the high mountain ranges on Taiwan. Packing winds near 80 kt, Betty crossed into southern Taiwan about 15 nm north of Taitung. Unofficial reports indicated 12 dead, scores injured, and hundreds homeless in the typhoon's wake. Nearly a thousand tourists were stranded as mud slides covered highways. In addition, more than 200 homes were leveled and hundreds of others damaged.

After crossing the mountains of southern Taiwan, the storm's track became west-southwestward. Weakened by the rugged terrain, Betty entered the Taiwan Strait as a minimal typhoon. It continued to weaken and crossed the Chinese coast on the evening of the 23rd with 50 kt winds. By the 24th, Betty had degenerated into a low pressure area some 100 nm north of Hong Kong.

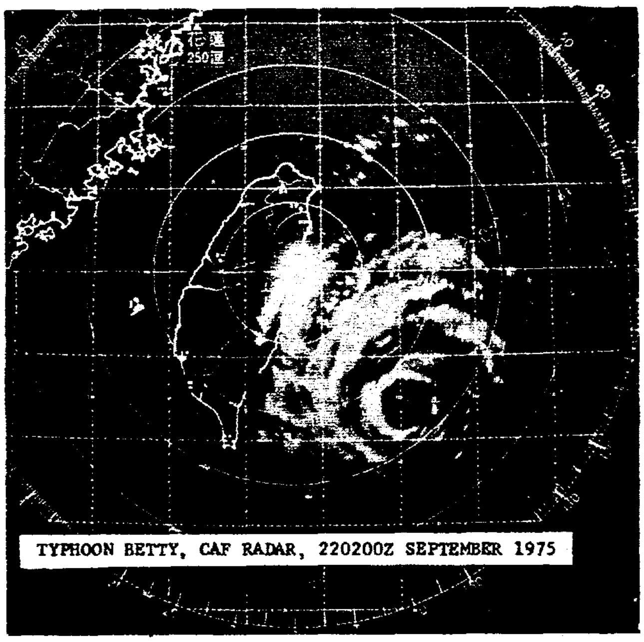


FIGURE 4-17. *Radar presentation of Typhoon Betty near peak intensity some 135 nm east of Taitung, 22 September 1975, 0200Z.*

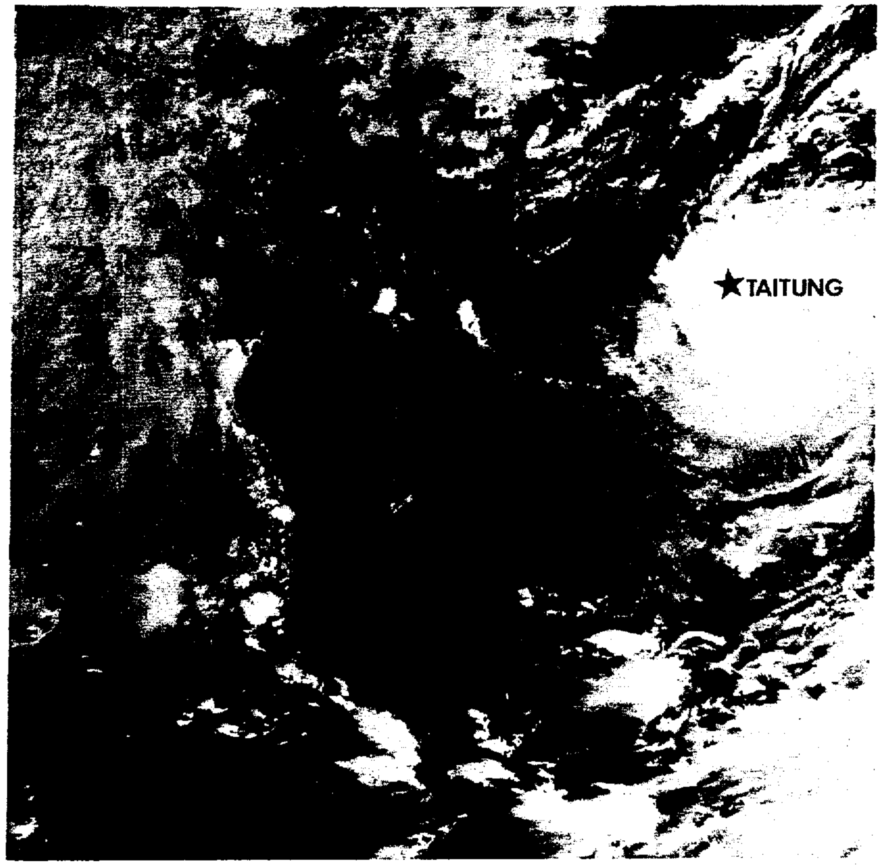


FIGURE 4-17a. *Typhoon Betty at 95 kt peak intensity some 135 nm east of Taitung, Taiwan, 22 Sept 1975, 0057Z. (DMSP imagery)*

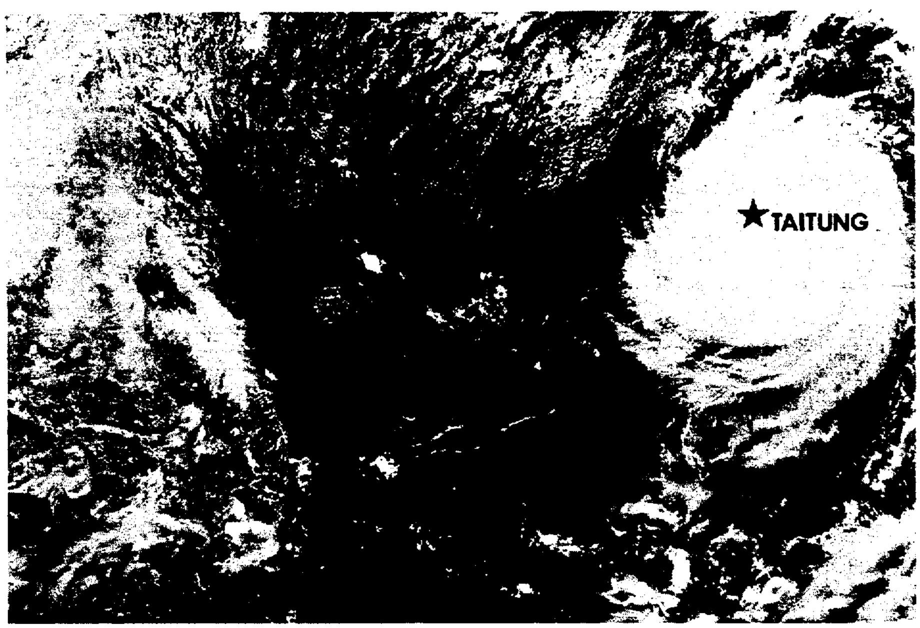
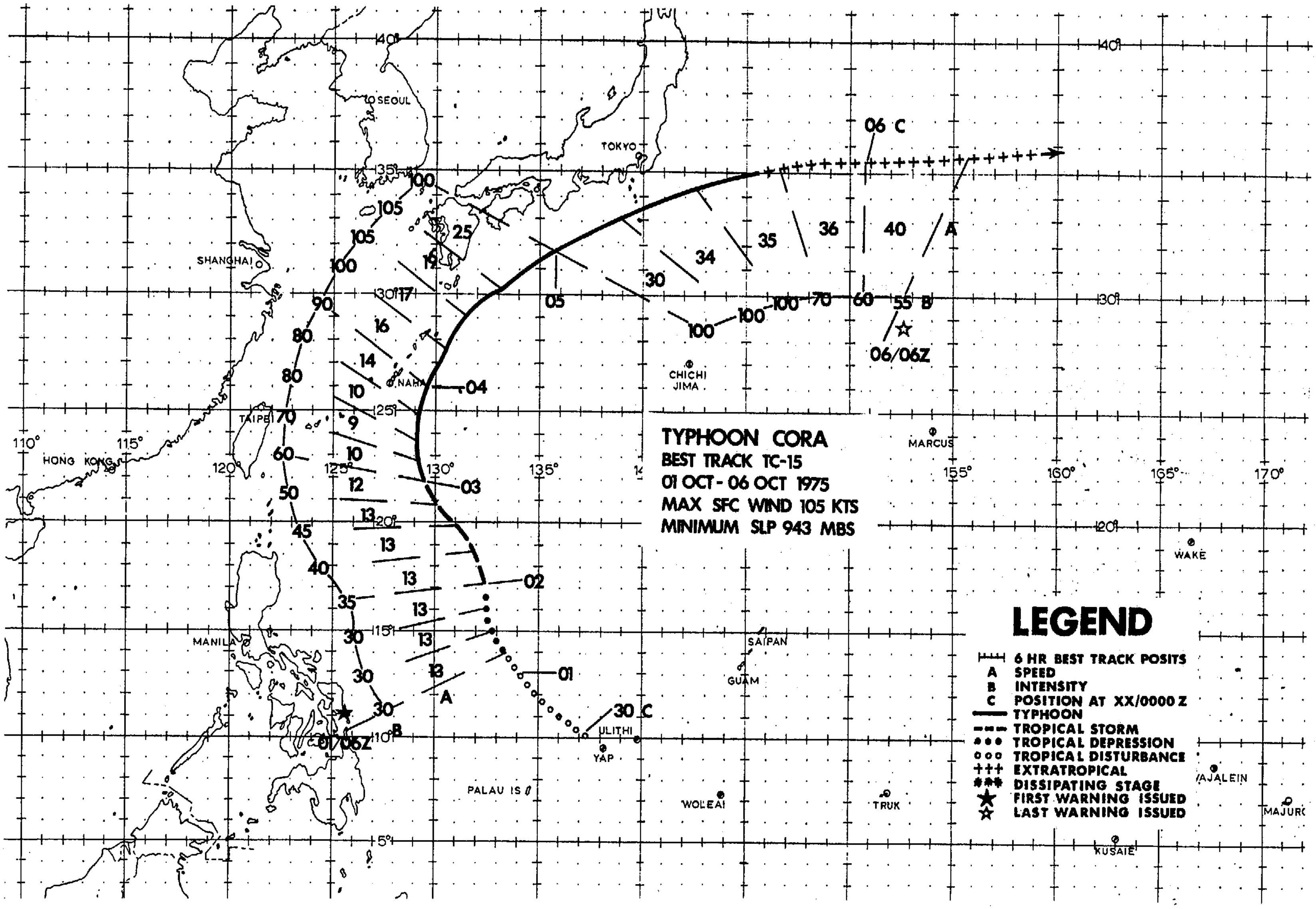


FIGURE 4-17b. *Typhoon Betty at peak intensity some 95 nm east of Taitung, 22 Sept 1975, 0438Z. (DMSP imagery)*


TYPHOON CORA
BEST TRACK TC-15
01 OCT - 06 OCT 1975
MAX SFC WIND 105 KTS
MINIMUM SLP 943 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
TAIPEI
HONG KONG
MANILA
NAHA
CHICHI JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
KWAJALEIN
MAJURO
KUSAIE
06 C
30 C
01/06Z
06/06Z
01
02
03
04
05

Weak troughing in the low level easterlies spawned a disturbance near 10N 142E on the morning of 29 September, as indicated by satellite and synoptic data. This disturbance drifted west-northwest for the next several days; on 1 October, aircraft reconnaissance reported surface winds of 30 kt.

For the next 24 hr, the 700 mb center was displaced as much as 25 nm to the northwest of the large and diffuse surface center. This center had a diameter as large as 80 nm with weak temperature and pressure gradients, and correspondingly light winds. From initial detection until the evening of the 3rd, development of a good outflow channel to the west and northwest was restricted by an upper tropospheric trough to the west. Despite this lack of outflow, the storm continued to develop. Cora was upgraded to typhoon strength on the 3rd when aircraft reconnaissance reported 70 kt surface winds and a closed wall cloud. The system continued to lack good vertical structure through the evening of the 3rd when the 700 mb center was still displaced east of the surface center.

For the first 48 hr, Cora was situated between two large high pressure cells and moved toward the northwest at 13 kt. On the 3rd, the high pressure cell north of Taiwan began to weaken rapidly and collapsed. Strong ridging was now building to the east of Cora. At this time (Fig. 4-18), Cora began to slow down prior to a gradual recurvature near 25N.

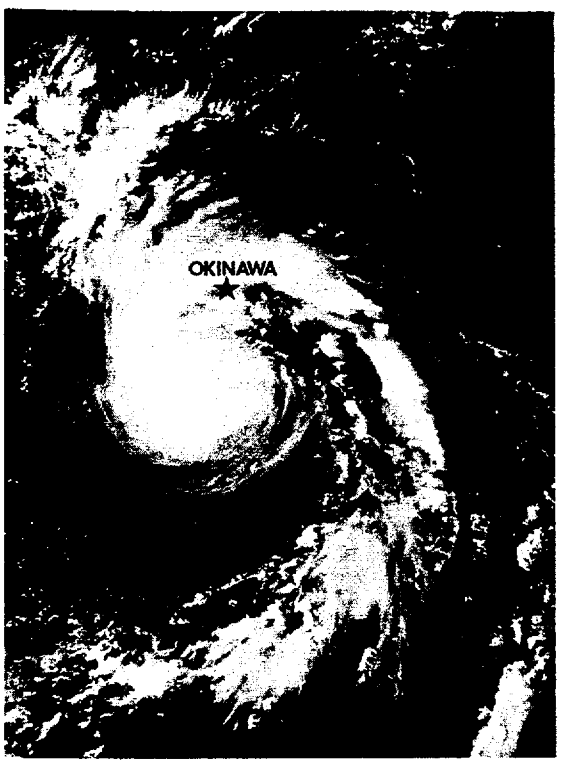


FIGURE 4-18. *Cora just prior to attaining typhoon intensity 255 nm south-southeast of Okinawa, 3 October 1975, 0254Z. (DMSP imagery)*

As Cora passed 100 nm to the east of Okinawa on the morning of the 4th, Kadena AB recorded a peak gust of 31 kt. The system now began a gradual acceleration as it entered an area of strong westerlies to the northeast of the high pressure cell. That evening Cora attained a minimum central pressure of 943 mb and maximum sustained surface winds of 105 kt (Fig. 4-19). Both satellite and synoptic data indicated excellent outflow in all quadrants except the northwest where a minor trough was still restricting the outflow.

By the morning of the 5th, satellite and synoptic data indicated that the primary upper-level outflow was now confined to the north-northeast. Although Cora was in an area of strong vertical shear, typhoon strength winds were still maintained for the next 24 hr. Moving to the northeast at 30 kt, the typhoon continued to come into increasingly strong westerly steering flow. Cora passed 120 nm south-southeast of Tokyo on the evening of the 5th.

Satellite data on the 6th indicated that there was very little upper-level outflow, but an apparent low-level circulation was still visible. The remains of Cora were now moving to the east at 40 kt as an extratropical system with surface winds of 55 kt.

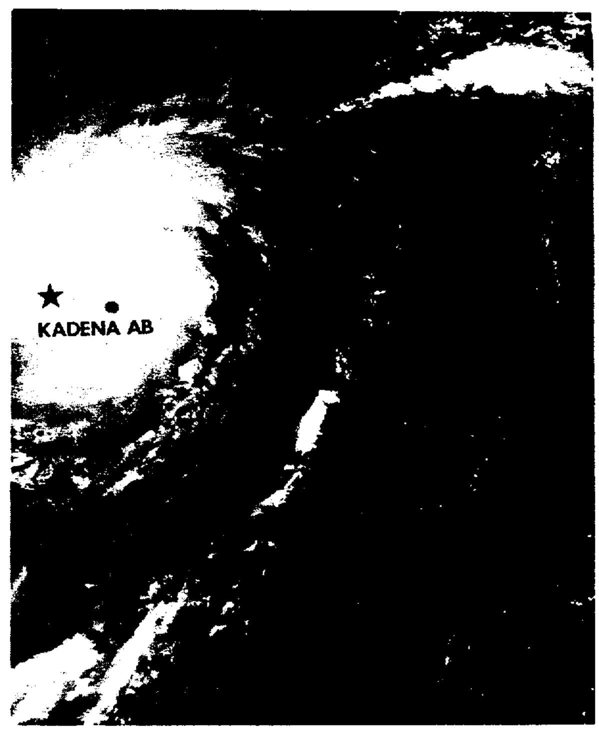
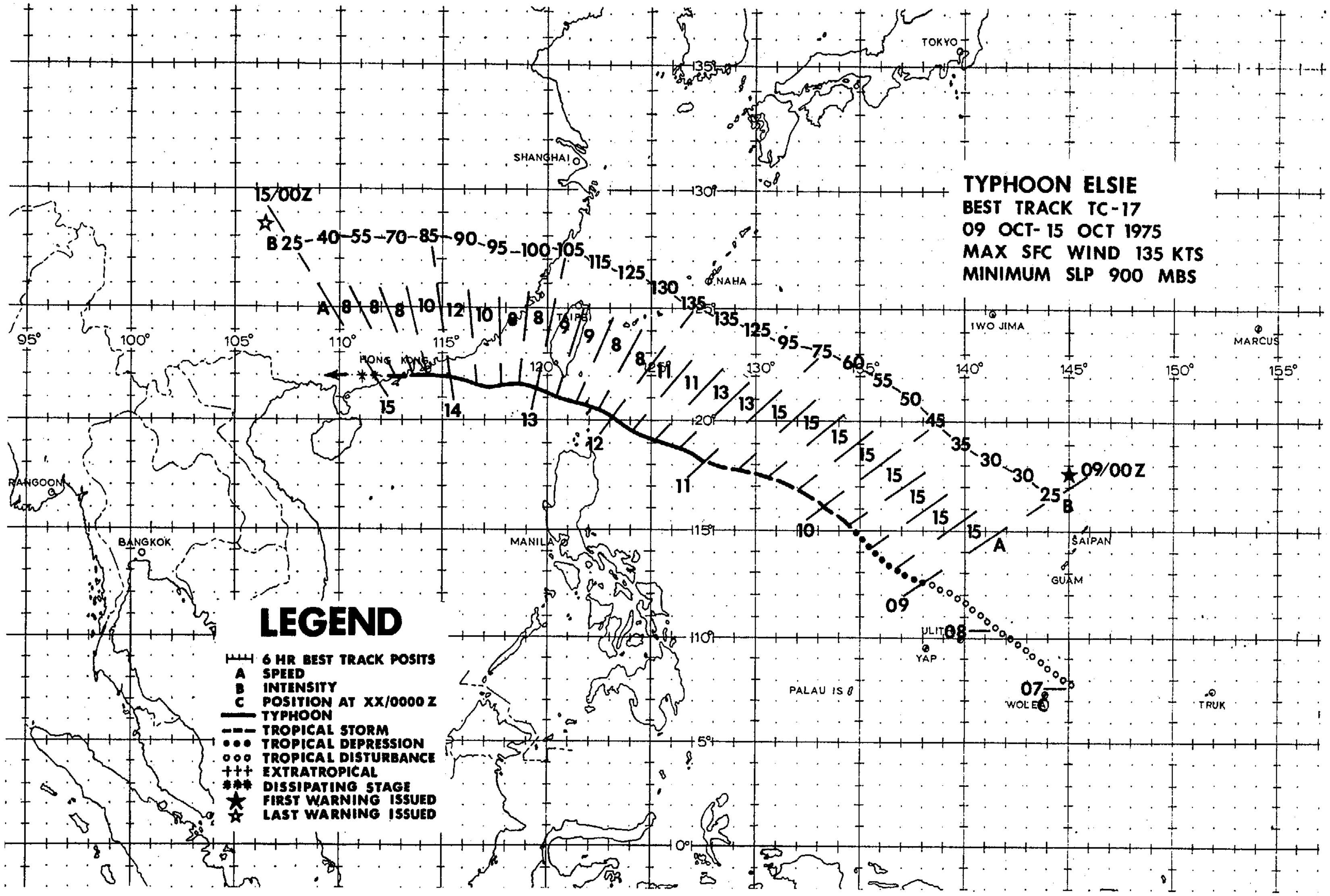


FIGURE 4-19. *Typhoon Cora near 95 kt 115 nm east of Kadena AB, Okinawa, 4 October 1975, 0236Z. (DMSP imagery)*


TYPHOON ELSIE
BEST TRACK TC-17
09 OCT- 15 OCT 1975
MAX SFC WIND 135 KTS
MINIMUM SLP 900 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
15/00Z
09/00Z
TOKYO
SHANGHAI
NAHA
IWO JIMA
MARCUS
HONG KONG
TAIPEI
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
RANGOON
BANGKOK

By the 6th of October, the monsoonal trough had become quite active and was oriented east-west along 8N from the Philippines to 160E. Typhoon Elsie developed in this trough with a well-defined surface circulation located approximately 250 nm southwest of Guam on the 8th. The first warning was issued on the morning of the 9th and Elsie attained typhoon strength 48 hr later. At this point, Elsie began slowing down as the storm approached the western extent of the mid-tropospheric subtropical ridge.

Elsie then underwent explosive deepening (Fig. 4-20) and aircraft reconnaissance recorded a 69 mb drop in the central pressure at the typhoon center between the 102052Z and 111430Z fixes. The maximum surface winds increased from 65 kt to 135 kt during this period.

As Elsie approached the Bashi Channel, Basco, in the Bataan Islands (WMO station 98135, elev 184 ft), 40 nm east of Elsie's center, reported maximum sustained winds of 65 kt. Elsie continued moving west-northwest through the Bataan Islands on the 12th. As the sub-tropical ridge then built westward, Elsie began a more westerly track into the South China Sea. As the typhoon entered the South China Sea (Fig. 4-21), it began to weaken with inflow restricted to the north by the Asian continent. Still, the Royal Observatory, Hong Kong, reported that typhoon Elsie was one of the most intense typhoons ever to affect Hong Kong in the month of October. Royal Observatory radar began tracking the storm by late afternoon on the 13th and Elsie passed 35 nm to the south of Hong Kong on the 14th. At that time the maximum sustained winds recorded at Hong Kong were 70 kt with gusts up to 118 kt. Fortunately, the maximum winds occured at a low tide, thus reducing flooding. Seven ocean going vessels drifted from their moorings and one small craft and a fishing junk capsized. The lowest pressure recorded in Hong Kong was 987.5 mb. There were no fatalities reported, but 46 people were injured by flying debris.

After passing south of Hong Kong, Elsie continued westward, making landfall on the southern China coast at approximately 1500Z on the 14th. Elsie then dissipated rapidly over the Asian mainland.

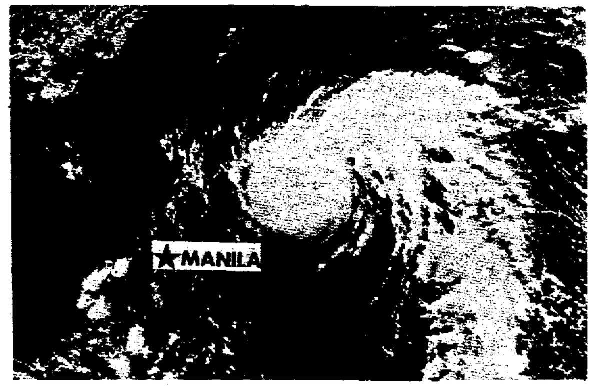


FIGURE 4-20. *Typhoon Elsie beginning explosive deepening some 420 nm northeast of Manila, 11 October 1975, 0348Z. (DMSP imagery)*

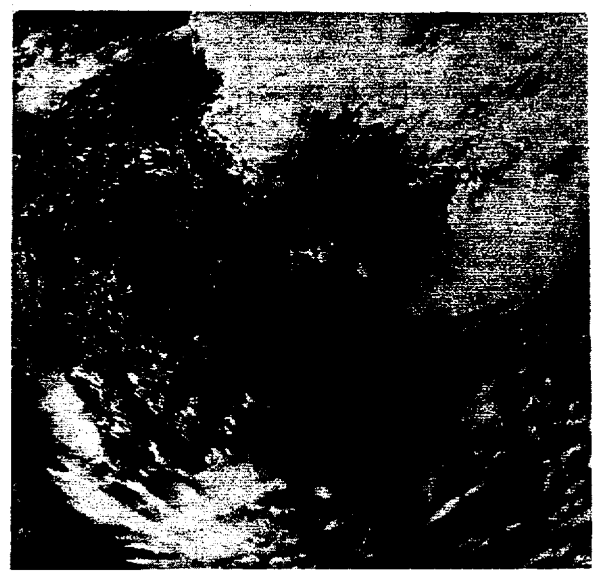
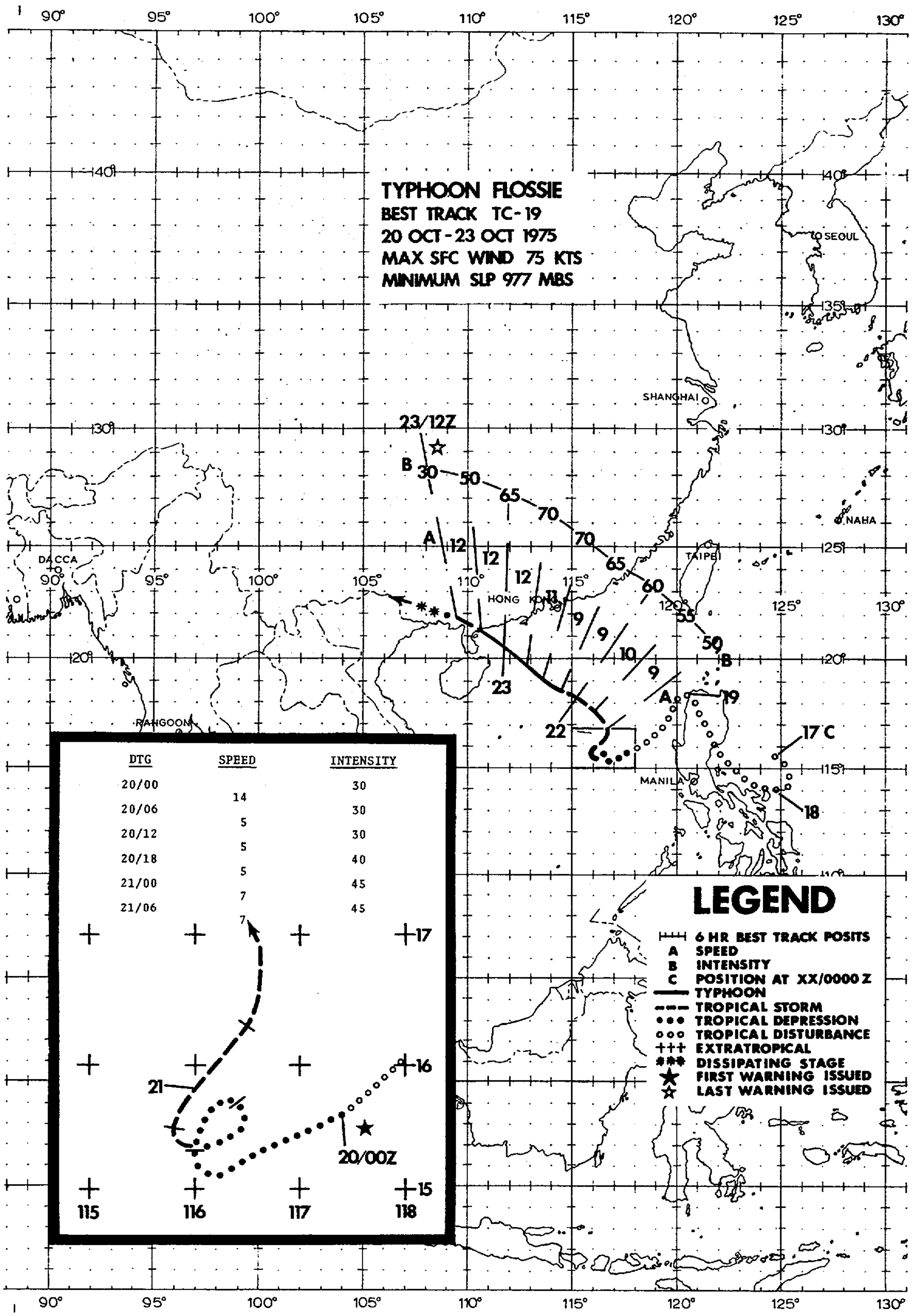


FIGURE 4-21. *Typhoon Elsie entering the South China Sea 260 nm east of Hong Kong, 13 October 1975, 0452Z. (DMSP imagery)*


TYPHOON FLOSSIE
BEST TRACK TC-19
20 OCT - 23 OCT 1975
MAX SFC WIND 75 KTS
MINIMUM SLP 977 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
DACCA
RANGOON
23/12Z
17 C
18
19
21
22
23
20/00Z
DTG SPEED INTENSITY
20/00 30
14
20/06 30
5
20/12 30
5
20/18 40
5
21/00 45
7
21/06 45
7
90° 95° 100° 105° 110° 115° 120° 125° 130°
115 116 117 118

The circulation which was to become Typhoon Flossie was first analyzed 500 nm west-southwest of Guam on the 0000Z surface analysis of 14 October. This disturbance, apparently initiated by an upper tropospheric cyclone, then began drifting west. Its development was somewhat retarded on the 15th and 16th by the presence of T.D. 18 420 nm to the north-northeast. On the 19th the disturbance moved into the South China Sea after crossing Luzon and began to intensify.

The first warning was issued on the morning of the 20th based on satellite and synoptic data. Early the next morning reconnaissance aircraft reported a central pressure of 989 mb and T.D. 19 was upgraded to Tropical Storm Flossie.

Mid-tropospheric ridging extending from the central North Pacific to the northern portion of the South China Sea was the controlling factor in steering Flossie. A weakness developed in this ridge during the next few days, producing extremely weak steering flow. This caused the storm to follow an erratic track during the period from 200000Z to 211200Z (Fig. 4-22).

A container ship, the SS Mayaquez, reported a pressure of 980 mb and 60 kt winds on the afternoon of the 21st. At that time the Mayaquez was 40 nm south-southwest of the storm center. Flossie was upgraded to typhoon on the afternoon of the 22nd when located about 250 nm south of Hong Kong. Two timber freighters, the Ming Sing and Kinabalu Satu, sunk between Flossie and the southern approaches to Hong Kong on the 21st and 22nd, respectively. Due to the high seas and typhoon force winds, all rescue efforts failed and a total of 44 men were lost. Three survivors were picked up in a life boat a week later.

Flossie reached a maximum intensity of 70 kt on the evening of the 22nd. By the 23rd, the mid-tropospheric ridging was reestablished, and Flossie tracked northwest in the expected climatological direction for this area and time of year. As the typhoon approached landfall on the 23rd, its circulation was disrupted in the northeast quadrant by the terrain and its intensity began to diminish rapidly. Flossie made landfall on the afternoon of the 23rd on the northeast portion of the Luichow Peninsula (Fig. 4-23). Winds at that time were down to 50 kt.

Although Typhoon Flossie's maximum winds were only 70 kt, the seas generated in the northern South China Sea remained a threat to shipping for several days.

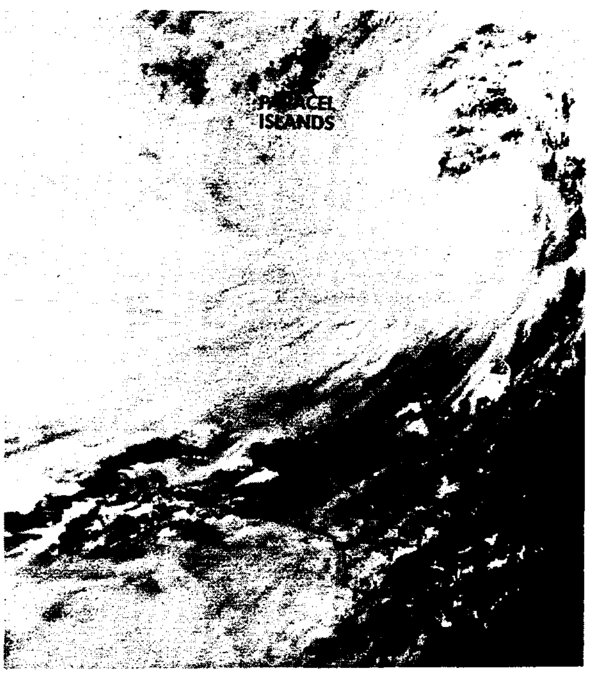


FIGURE 4-22. *Flossie as a 45 kt tropical storm approximately 225 nm east-southeast of the Paracel Islands, 21 October 1975, 0032Z. (DMSP imagery)*

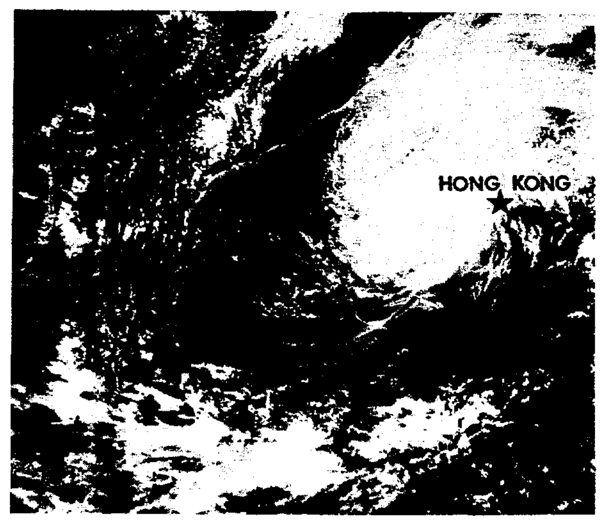
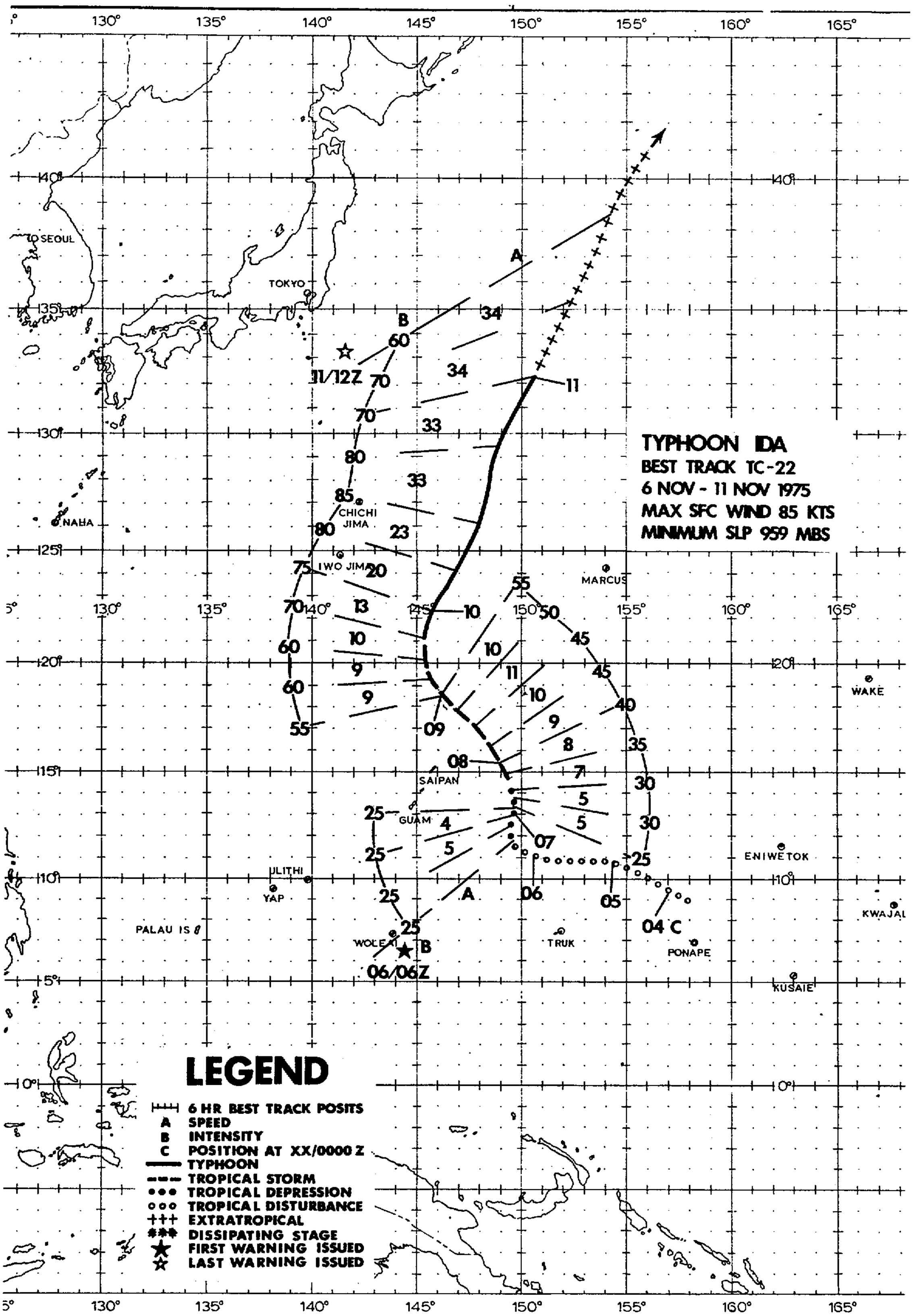


FIGURE 4-23. *Flossie just prior to making landfall on Luichow Peninsula some 200 nm west-southwest of Hong Kong. (DMSP imagery)*


TYPHOON IDA
BEST TRACK TC-22
6 NOV - 11 NOV 1975
MAX SFC WIND 85 KTS
MINIMUM SLP 959 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ENIWETOK
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KWAJAL
KUSAIE
11/12Z
06/06Z

Destined to spend its entire life cycle at sea, Typhoon Ida was first observed as a tropical disturbance on the 4th of November, 150 nm northwest of Ponape. The disturbance initially tracked westward at 8 kt with dual circulation centers oriented along a northeast to southwest axis. The disturbance became a tropical depression at 0600Z on the 6th and then began moving toward the north through a weakness in the mid-tropospheric subtropical ridge. The depression continued to move north at 4-5 kt for the next 24 hr while the two circulation centers consolidated into one.

Early on the morning of the 8th, the depression was upgraded to Tropical Storm Ida (Fig. 4-24) and it accelerated toward the northwest at 10 kt. Ida continued to intensify as the center passed near the Southern Mariana Islands, with wind gusts of 32 kt reported on Guam on the 7th. On the 9th Pagan Island in the Northern Marianas reported 40 kt winds.

By the 9th, Ida came under the influence of a deep mid-latitude trough centered 600 nm to the west and began to recurve. The storm attained typhoon intensity (Fig. 4-25) by 1800Z on the 9th and began tracking toward the north-northeast at an accelerated rate. A minimum central pressure of 959 mb was observed by aircraft reconnaissance at 1437Z on the 10th. By 0000Z on the 11th, Ida was moving toward the north-northeast at 33 kt and had lost much of her tropical cyclone characteristics as evidenced by satellite data (Fig. 4-26). Twelve hours later, Ida had combined with a frontal system and continued to move rapidly northeastward as an extratropical system.

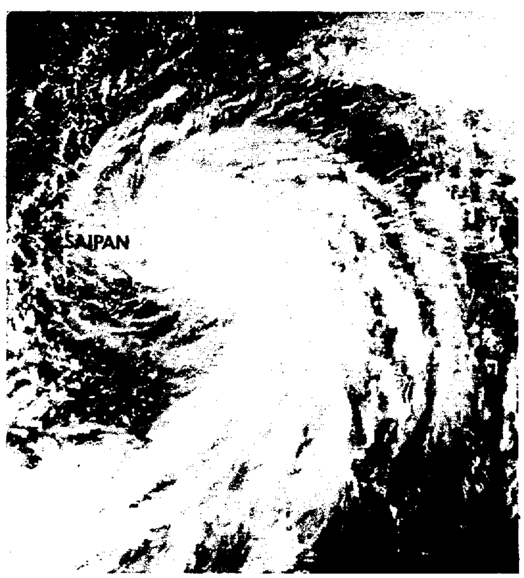


FIGURE 4-24. *Ida just prior to achieving tropical storm intensity 255 nm east-northeast of Guam, 7 November 1975, 2224Z. (DMSP imagery)*

FIGURE 4-25. *Typhoon Ida near 75 kt during recurvature 420 nm north of Saipan, 9 November 1975, 2329Z. (DMSP imagery)*

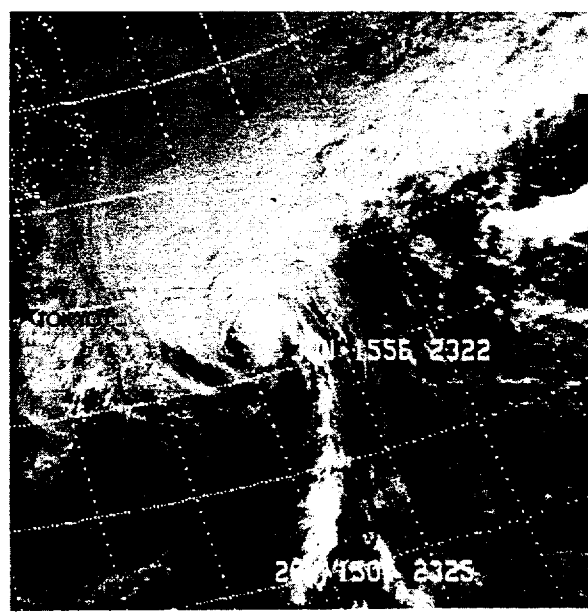
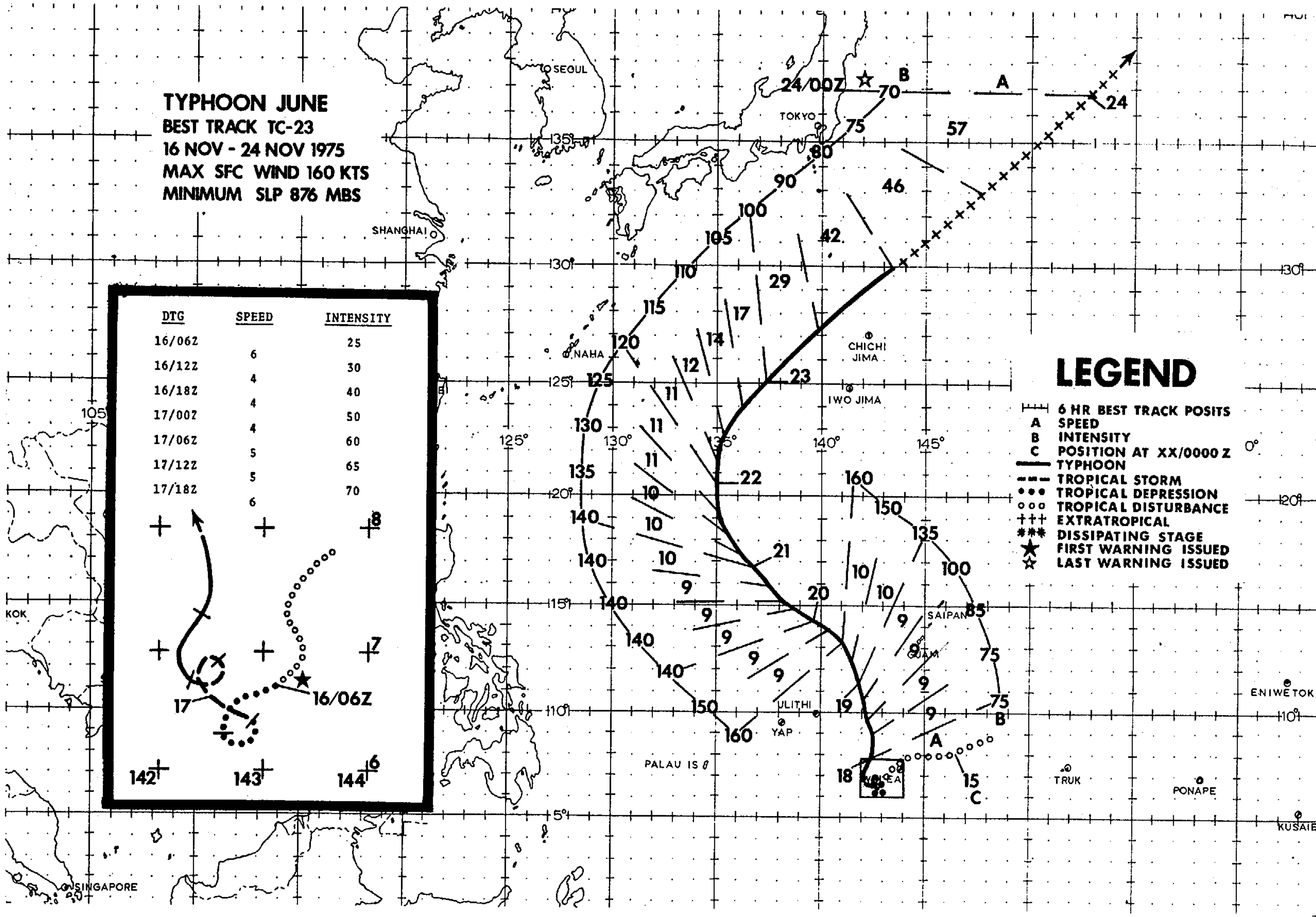


FIGURE 4-26. *Typhoon Ida becoming extratropical 575 nm east-southeast of Tokyo, 10 November 1975, 2321Z. (NOAA-4 imagery)*


TYPHOON JUNE
BEST TRACK TC-23
16 NOV - 24 NOV 1975
MAX SFC WIND 160 KTS
MINIMUM SLP 876 MBS
DTG SPEED INTENSITY
16/06Z 25
6
16/12Z 30
4
16/18Z 40
4
17/00Z 50
4
17/06Z 60
5
17/12Z 65
5
17/18Z 70
6
16/06Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
24/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
TRUK
PONAPE
ENIWETOK
KUSAIE
SINGAPORE

The last typhoon of the year was to become the most intense on record. At 0843Z on 19 November, reconnaissance aircraft measured a record low 700 mb height of 1984 m while traversing the eye and obtained a coincident minimum sea level pressure (MSLP) of 876 mb (25.87 in) by dropsonde near the cloud wall. This observation was the lowest on record, slightly lower (1 mb) than Typhoons Ida in 1958 and Nora in 1973. June's central pressure well surpasses the lowest Western Hemisphere reading (892.3 mb), and that obtained by aircraft in Hurricane Camille (905 mb).

June had been under frequent surveillance by satellite and aircraft since her birth in the central Carolines on the 16th. Initially, the system moved slowly westward, becoming quasi-stationary near 6N 143E (445 nm south of Guam), the result of weak steering flow near the equator (Fig. 4-27).

On the 18th, June began to move northward, perhaps in response to a weakness in the 500 mb ridge caused by a deep trough approaching from the west. Simultaneously, June began to rapidly deepen, her surface pressure plummeting 52 mb in 11 hr and 90 mb in 24 hr. By the 19th, the winds of Super Typhoon June had increased to an estimated 160 kt as the typhoon reached its lowest pressure, some 230 nm west-southwest of Guam (Fig. 4-28). As June tracked north-northwest toward a weakness in the 500 mb ridge, the system reached exceptionally large proporations. Sustained

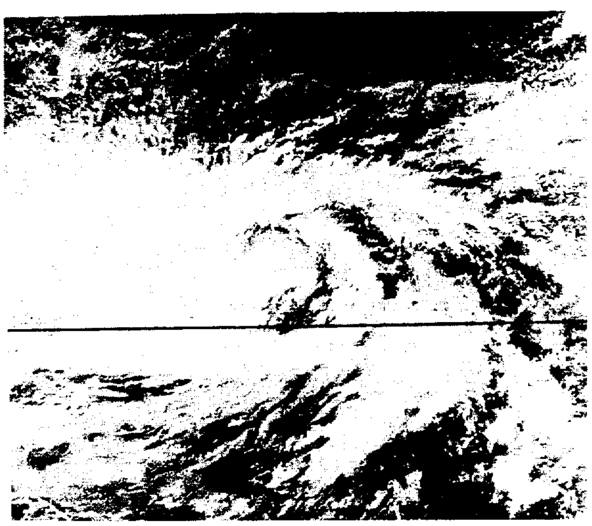


FIGURE 4-27. *June at tropical storm intensity 420 nm south-southwest of Guam, 16 November 1975, 2302Z. (DMSP imagery)*

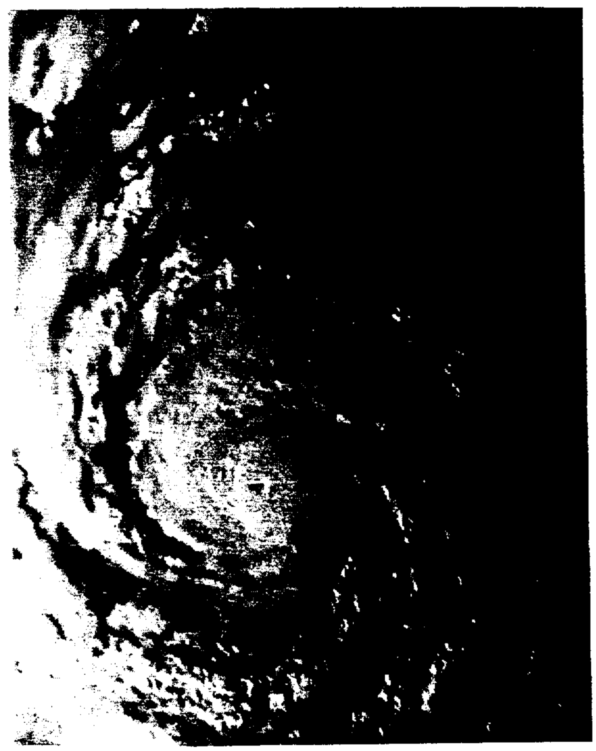


FIGURE 4-28. *Super Typhoon June near 160 kt peak intensity 210 nm west of Guam. Lightening discharge can be seen across the eye of the moonlight photograph, 19 November 1975, 1002Z. (DMSP imagery)*

surface winds of 50 kt or greater extended 200 nm outward from the center.

On the evening of the 19th, June passed approximately 200 nm to the west of Guam. More than 3,200 island residents fled into evacuation centers. There was severe flooding in low-lying areas, with several buildings and homes damaged or destroyed by gale force winds and storm surge. A peak gust of 70 kt was recorded at Andersen AFB. Island losses amounted to an estimated $300,000 with most of the damage to crops.

Eauripik Atoll in Yap district suffered severe property and crop damage. Newspaper reports stated that "sizable portions" of the island were washed away by the heavy seas, but that no deaths or injuries occurred. Flooding and crop damage were also reported on Woleai Atoll and on other low-lying islands in Yap district; however, no casulaties were reported on any of the islands.

After passing abeam of Guam, Super Typhoon June turned northwest (Fig. 4-29). On the 22nd, June began recurving toward the northeast with maximum winds down to 100 kt. On the 23rd (Fig. 4-30), the storm began accelerating rapidly in the strong westerlies and its forward speed reached nearly 60 kt. With an influx of cold air, June became extratropical above 30N, still possessing winds of typhoon intensity.

FIGURE 4-29. *Super Typhoon June at 145 kt heading to the northwest away from Guam, 19 November 1975, 2348Z. (DMSP imagery)*

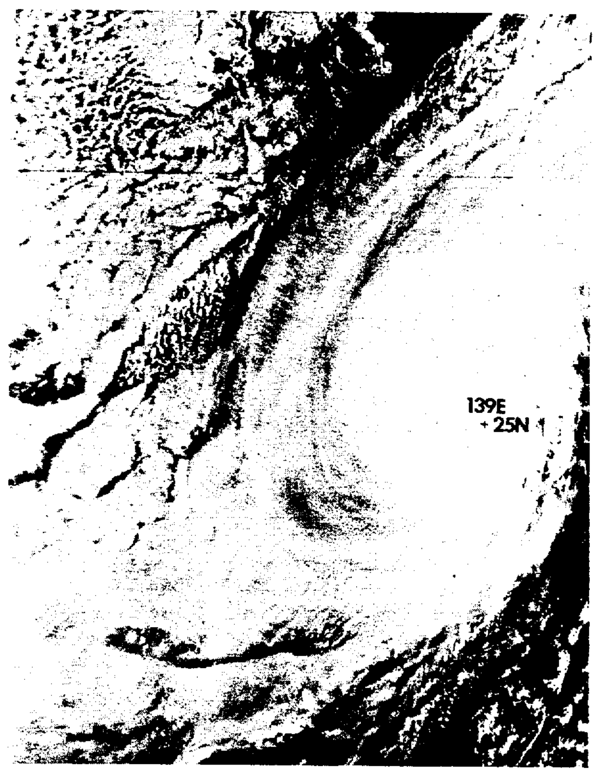
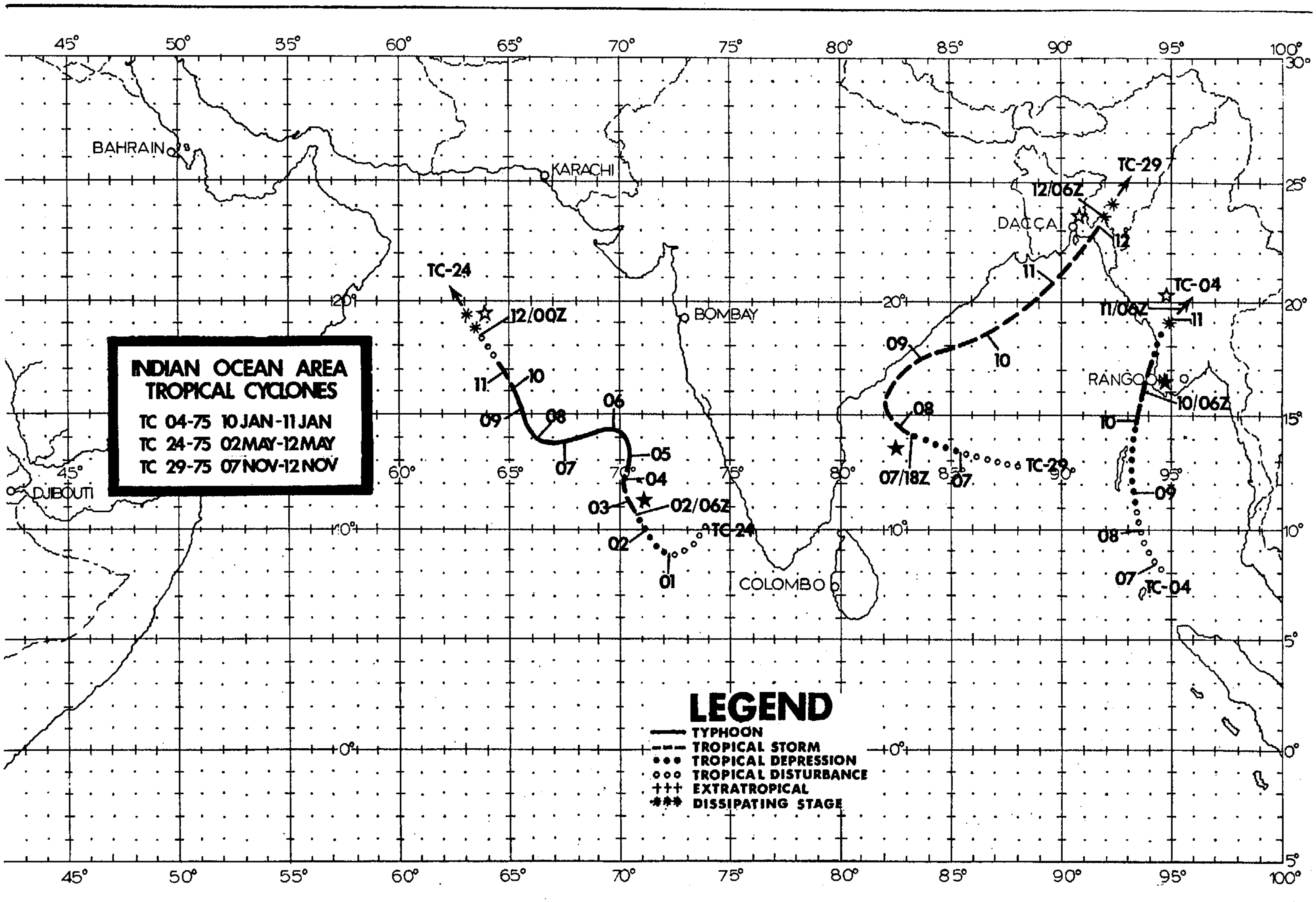
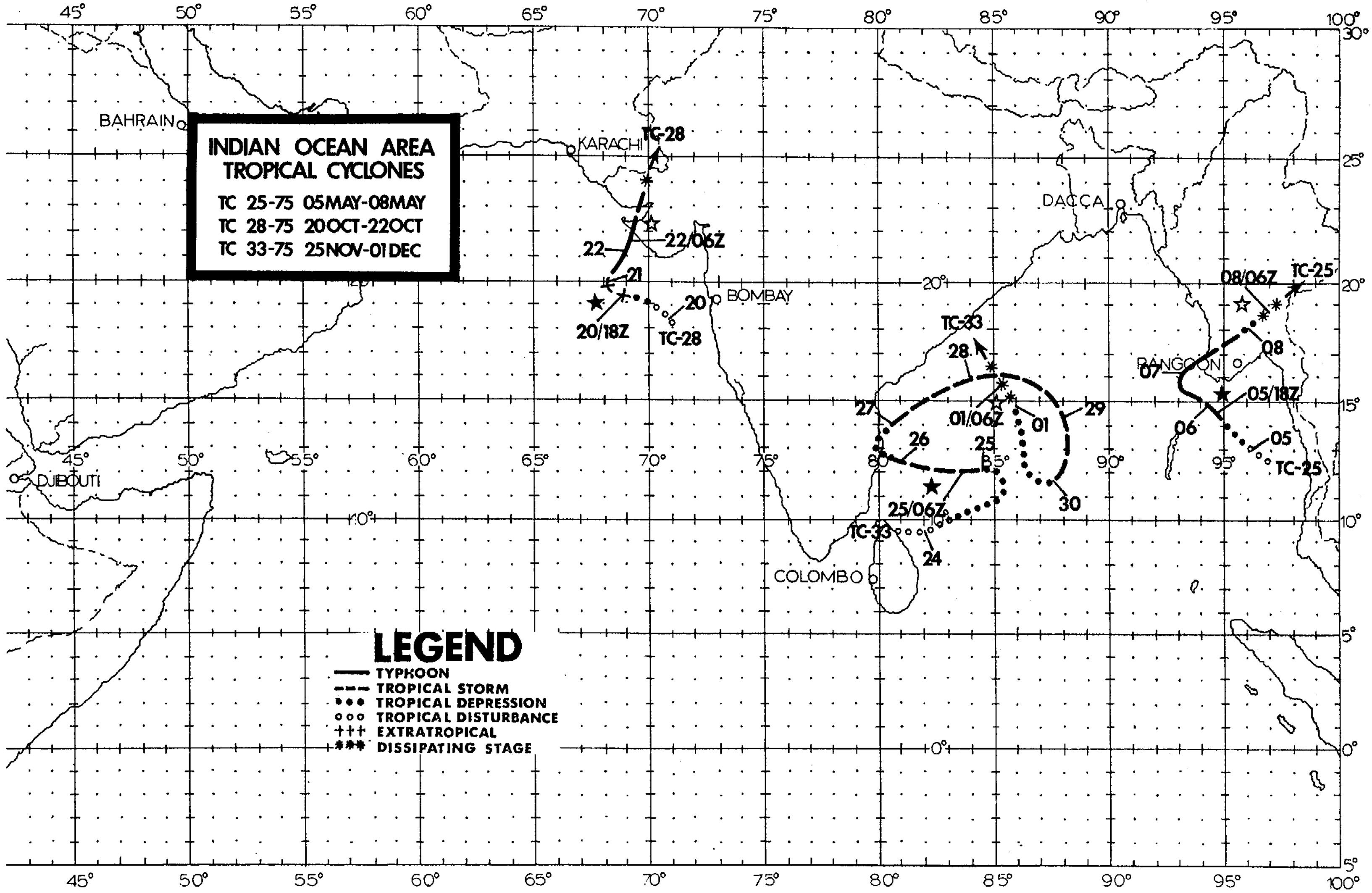


FIGURE 4-30. *June maintaining 100 kt winds as she accelerates after recurvature, 22 November 1975, 2252Z. (DMSP imagery)*


INDIAN OCEAN AREA
TROPICAL CYCLONES
TC 04-75 10 JAN-11 JAN
TC 24-75 02 MAY-12 MAY
TC 29-75 07 NOV-12 NOV
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
BAHRAIN
KARACHI
BOMBAY
DACCA
RANGOON
COLOMBO
DJIBOUTI
TC-24
TC-29
TC-04
12/00Z
02/06Z
07/18Z
12/06Z
11/06Z
10/06Z


INDIAN OCEAN AREA
TROPICAL CYCLONES
TC 25-75 05MAY-08MAY
TC 28-75 20OCT-22OCT
TC 33-75 25NOV-01DEC
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
BAHRAIN
KARACHI
DACCA
BOMBAY
RANGOON
DJIBOUTI
COLOMBO
TC-28
22/06Z
22
21
20
20/18Z
TC-33
28
27
26
25
01/06Z
01
29
30
25/06Z
24
TC-25
08/06Z
08
07
06
05/18Z
05

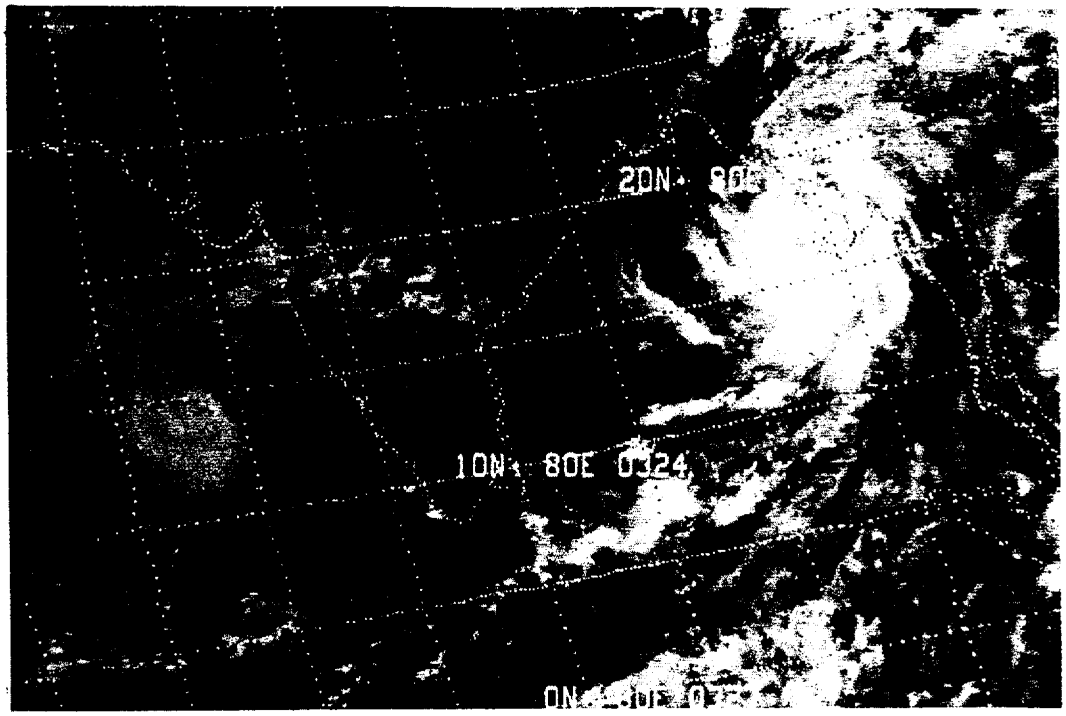


FIGURE 4-31. *Tropical cyclones 24-75 (Arabian Sea) and 25-75 (Bay of Bengal), 7 May 1975, 0322Z. T.C. 24-75, near 75 kt, is some 450 nm southwest of Bombay. T.C. 25-75, near its 75 kt peak intensity, is 65 nm west of the Burma coast. (NOAA-4 imagery)*

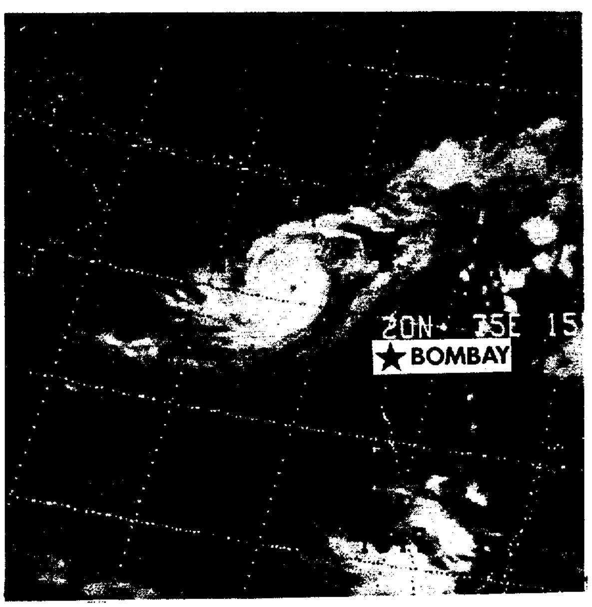


FIGURE 4-32. *Infrared imagery of Tropical Cyclone 28-75 near 65 kt some 270 nm west-northwest of Bombay, 21 October 1975, 1550Z. (NOAA-4 imagery)*

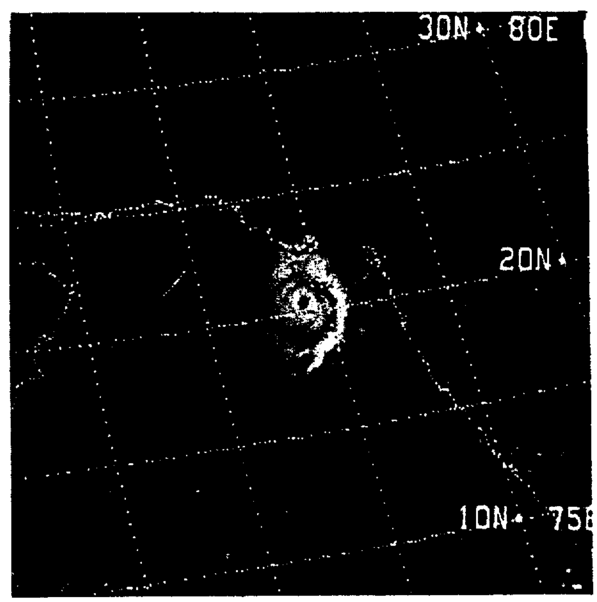


FIGURE 4-33. *Tropical Cyclone 28-75 at 80 kt peak intensity some 40 nm south-southwest of landfall on northwestern India, 22 October 1975, 0404Z. (NOAA-4 imagery)*

5. TROPICAL CYCLONE CENTER FIX DATA

Fix data for 197~~5~~6 will be published in a separate Technical Note. This Tech Note will include fix data for all storms in the PACOM area west of 140W and north of the equator. To obtain a copy of this report write:

Commanding Officer
Fleet Weather Central/JTWC
COMNAVMARIANAS Box 12
FPO San Francisco 96630

A computation of closest distance to the best track (right angle error) is also calculated. Right angle error, graphically depicted in Figure 5-2, is a measure of ability to forecast the path of motion without regard to speed.

CHAPTER V — SUMMARY OF FORECAST VERIFICATION DATA

1. ANNUAL FORECAST VERIFICATION

a. POSITION FORECAST VERIFICATION

Forecast positions for the warning, 24-, 48-, and 72-hour forecasts are verified against the best track. Positions for storms over land, dissipated or extratropical are not verified. In addition to the overall verifications depicted in Table 5-1, a separate verification for only Pacific Area typhoons is computed. This information is listed in Table 5-2, for comparison with previous years. This same information is depicted graphically in Figure 5-1. In the Indian Ocean Area, no 72-hour forecasts are available for verification, and no attempt is made to segregate storms by intensity. Error statistics for this area are summarized in Tables 5-3 and Figure 5-2.
5-2 and

b. INTENSITY FORECAST VERIFICATION

Intensity verification statistics for tropical cyclones attaining typhoon intensity are depicted in Table 5-4. Adherance to a standardized pressure-height versus wind speed relationship and improved satellite analysis techniques have resulted in a low initial position intensity error (4 kt) over the past two seasons. This in turn has contributed to smaller 24-, 48-, and 72-hour intensity forecast deviations from the JTWC best track.

2. COMPARISON OF OBJECTIVE TECHNIQUES

a. GENERAL

Objective techniques have been verified annually since 1967, however year-to-year modifications and improvements prevent any long term comparisons of the various techniques. The analog technique provides three movement forecasts, one for straight moving storms, one for recurving storms and one combining the tracks of straight, recurving and other storms that do not meet the criteria as ~~straight or recurving analogs.~~ However, only the combined is listed for verification. The analog technique also provides an intensity forecast for each warning position. The dynamic objective technique employs the steering concept of a point vortex in a smoothed large-scale flow field. An intensity forecast scheme is based on statistical regression equations of analog storms.

b. DESCRIPTION OF OBJECTIVE TECHNIQUES

(1) TYFN75-Analog program which scans history tapes for storms similar (within a specified acceptance envelope) to the instant storm. Three 24-, 48-, and 72-hour forecasts are provided. In addition 24-, 48-, and 72-hour intensity forecasts are provided.

(2) MOHATT 700/500-Steering program which advects a point vortex on a pre-

New

TABLE 5-1. 1975 JTWC ERROR SUMMARY FOR THE WESTERN NORTH PACIFIC

		WARNING			24 HOUR			48 HOUR			72 HOUR		
	CYCLONE	POSIT ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS
1.	TY LOLA	20	12	23	166	98	19	290	125	15	455	129	11
2.	TD 02	25	10	16	78	44	13	--	--	--	--	--	--
3.	TS MAMIE	31	12	9	161	38	5	--	--	--	--	--	--
4.	TY NINA	16	11	15	135	75	11	299	170	5	424	41	1
5.	TD 05	41	39	4	--	--	--	--	--	--	--	--	--
6.	TY ORA	22	8	9	167	92	5	32	31	1	--	--	--
7.	TY PHYLLIS	20	12	27	166	114	23	351	257	19	495	403	12
8.	TY RITA	22	12	22	132	66	18	283	168	14	433	280	10
9.	TS SUSAN	36	27	19	176	139	10	513	456	2	--	--	--
10.	TY TESS	21	15	30	113	78	26	243	180	22	387	330	18
11.	TS VIOLA	31	18	10	203	113	6	518	344	2	--	--	--
12.	TY WINNIE	22	16	10	119	67	6	276	115	2	--	--	--
13.	TY ALICE	22	10	18	101	54	15	209	71	11	341	125	7
14.	TY BETTY	18	11	26	123	77	22	230	152	17	274	206	14
15.	TY CORA	22	16	18	153	83	14	415	230	10	825	420	6
16.	TS DORIS	27	19	10	124	91	6	321	257	2	--	--	--
17.	TY ELSIE	19	13	25	80	54	21	181	134	17	452	330	12
18.	TD 18	39	24	7	148	102	3	374	374	1	--	--	--
19.	TY FLOSSIE	23	12	14	142	83	10	258	176	6	333	324	2
20.	TS GRACE	29	17	28	184	92	20	344	143	14	580	156	8
21.	TS HELEN	27	25	6	92	81	2	--	--	--	--	--	--
22.	TY IDA	51	41	19	211	150	15	421	299	11	775	596	7
23.	TY JUNE	17	9	29	119	81	25	255	190	21	371	286	17
24.	TD 24	38	20	5	128	79	1	--	--	--	--	--	--
25.	TD 25	33	19	10	122	63	6	271	122	2	--	--	--
	ALL FORECASTS	25	16	408	138	84	301	288	181	194	450	290	125
	TYPHOONS ONLY	19	11	250	129	78	221	279	178	165	442	300	113

selected analysis or smoothed prognostic fields at the designated upper-levels in six-hour time steps through 72 hours. Utilizing the previous 12-hour history position, MOHATT computes the 12-hour forecast error and applies a bias correction to the forecast position.

(3) FCSTINT-Intensity forecast program which utilizes statistical regression equations to provide 24-, 48-, and 72-hour forecast intensities.

(4) 12-HR EXTRAPOLATION-A track through current warning position and 12-hour old preliminary best track position is linearly extrapolated to 24 and 48 hours.

(5) HPAC-Mean 24 and 48 hour forecast positions are derived by averaging the 24 and 48 hour positions from the 12-HR EXTRAPOLATION track and a track based on climatology.

(6) XT24-Similar to 12-HR EXTRAPOLATION, except 24 hr old preliminary best track and latest fix position are used. Rather than linear extrapolation, the actual forecast speed of movement is used.

(7) INJAH74-Analog program for North Indian Ocean. Similar to TYFN75, except tracks are not segregated.

c. TESTING AND RESULTS

It is of interest to compare the performance of the objective techniques to each other and to the official forecast as well. This information is listed in Table 5-5 for Pacific typhoons only and in Table 5-6 for all Pacific forecasts.

In these tables "X-AXIS" refers to the techniques listed horizontally across the top, while "Y-AXIS" refers to those listed vertically. As a matter of explanation, the example shown in Table 5-5 compares TYFC to ~~TYFS~~. In the 54 cases available for comparison, the average 24 hour vector error for TYFC was 126 nm, while that for XT24 ~~TYFS~~ was 136 nm. The difference of -7 nm is shown in the lower right.

TABLE 5-2. JTWC ANNUAL AVERAGE POSITION FORECAST ERROR FOR TROPICAL CYCLONES WHILE WIND OVER 35 KNOTS

	WESTERN NORTH PACIFIC**			INDIAN OCEAN***	
	24-HR	48-HR	72-HR	24-HR	48-HR
1950-58	170	---	---	---	---
1959	*117	*267	---	---	---
1960	177	354	---	---	---
1961	136	274	---	---	---
1962	144	287	476	---	---
1963	127	246	374	---	---
1964	133	284	429	---	---
1965	151	303	418	---	---
1966	136	280	432	---	---
1967	125	276	414	---	---
1968	105	229	337	---	---
1969	111	237	349	---	---
1970	98	181	272	---	---
1971	99	203	308	220	410
1972	116	245	382	193	233
1973	102	193	245	203	305
1974	114	218	351	137	238
1975	129	279	442	145	228
1976	117	282	336	148	190

*FORECAST POSITIONS NORTH OF 35°N WERE NOT VERIFIED.
**FOR TYPHOONS ONLY
***1971-1974 DOES NOT INCLUDE ARABIAN SEA

TABLE 5-3. 1975 JTWC ERROR SUMMARY FOR THE NORTH INDIAN OCEAN

	WARNINGS			24 HOUR			48 HOUR		
	POSIT ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS
TC 04-75	179	149	4	--	--	--	--	--	--
TC 24-75	58	48	21	119	83	19	206	136	17
TC 25-75	33	11	6	183	131	4	328	305	2
TC 28-75	32	26	4	138	96	2	--	--	--
TC 29-75	50	27	10	142	78	8	271	133	5
TC 33-75	98	65	6	243	187	4	175	5	1
ALL FCSTS	61	43	51	145	99	37	228	144	25

TABLE 5-4. JTWC ANNUAL AVERAGE INTENSITY FORECAST ERROR

	WESTERN NORTH PACIFIC*				INDIAN OCEAN**		
	WARNING POSITION	24-HR	48-HR	72-HR	WARNING POSITION	24-HR	48-HR
1971	7	16	21	24	--	--	--
1972	9	14	20	24	13	15	12
1973	7	16	20	28	8	15	20
1974	4	11	15	20	0	8	18
1975	4	13	18	20	7	14	18
1976	5	12	19	22	10	19	22
~~AVG~~	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVG	6	14	19	23	8	14	18

*FOR TYPHOONS ONLY
**1971-1974 DOES NOT INCLUDE ARABIAN SEA

new page

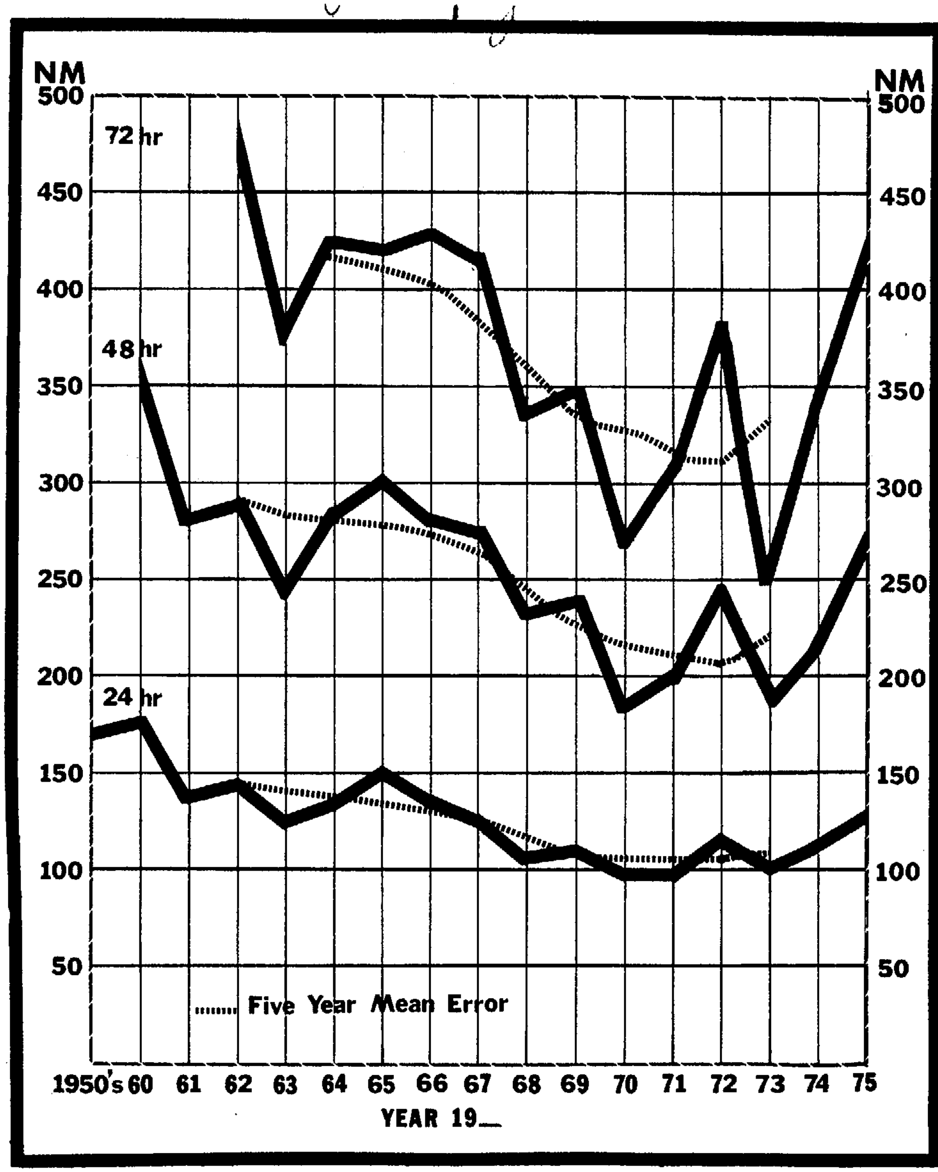


FIGURE 5-1. *Mean vector error for Pacific Area.*

New

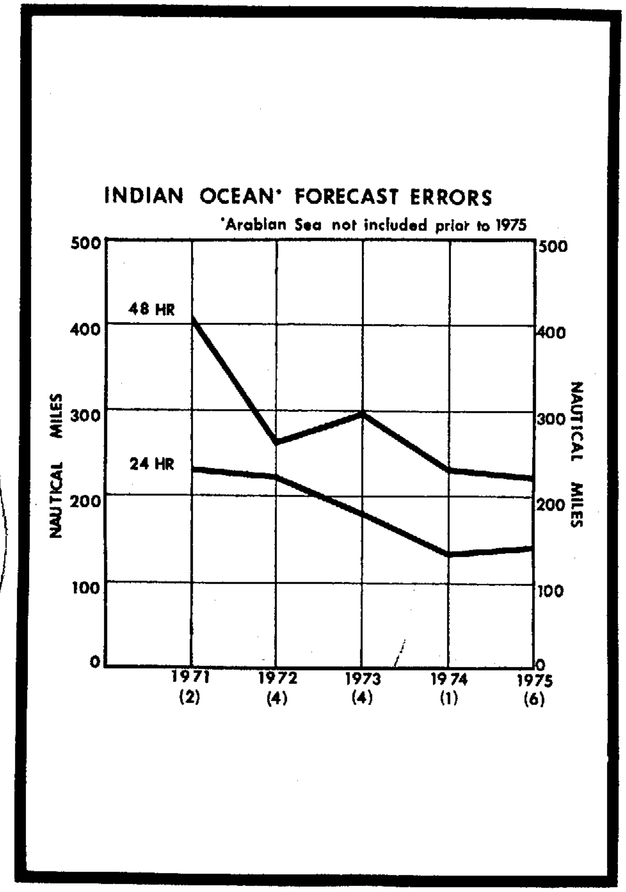


FIGURE 5-2. *Mean vector error for Indian Ocean Area.*

New

TABLE 5-5. 1975 OBJECTIVE TECHNIQUES FOR WESTERN NORTH PACIFIC TYPHOONS

24-HOUR

	JTWC	XTRP	HPAC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	221 129 129 0							
XTRP	205 130 142 12	205 142 142 0						
HPAC	183 128 135 7	182 138 135 -3	183 135 135 0					
TYFC	59 121 134 13	57 145 134 -11	53 121 132 11	59 134 134 0				
TYFS	195 127 144 18	184 135 144 10	165 130 140 11	54 137 136 -1	195 144 144 0			
TYFR	204 130 144 14	193 141 143 2	177 136 140 5	59 134 146 12	190 144 144 0	204 144 144 0		
MH70	144 133 159 26	143 148 159 12	126 137 145 8	37 101 141 40	128 149 148 -1	137 142 154 12	144 159 159 0	
MH50	138 133 144 11	136 148 143 -5	119 137 134 -3	37 102 115 13	122 151 137 -13	131 143 143 0	137 160 143 -17	138 144 144 0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y-X

48-HOUR

	JTWC	XTRP	HPAC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	165 279 279 0							
XTRP	153 289 321 32	153 321 321 0						
HPAC	133 280 251 -30	132 288 252 -37	133 251 251 0					
TYFC	49 300 341 41	47 369 341 -28	41 249 289 41	49 341 341 0				
TYFS	153 285 359 74	144 318 351 42	125 243 338 94	48 344 442 98	154 358 358 0			
TYFR	157 289 300 11	148 319 298 -21	129 250 274 24	49 341 358 16	153 358 298 -59	158 300 300 0		
MH70	98 291 357 66	97 343 360 18	81 249 299 50	26 341 521 180	91 377 354 -23	95 299 354 55	98 357 357 0	
MH50	96 292 356 64	94 344 358 14	78 249 276 27	26 347 443 96	89 381 357 -24	93 302 358 56	95 358 355 -3	96 356 356 0

JTWC-OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP-12-HOUR EXTRAPOLATION
HPAC-MEAN OF XTRP AND CLIMATOLOGY
TYFC-TYFN75 (WEIGHTED CLIMO) COMBINED
~~TYFS-TYFN75 (WEIGHTED CLIMO) STRAIGHT~~
~~TYFR-TYFN75 (WEIGHTED CLIMO) RECURVE~~
MH70-MOHATT 700-MB PROG
MH50-MOHATT 500-MB PROG

72-HOUR

	JTWC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	113 442 442 0					
TYFC	34 472 520 48	35 520 520 0				
TYFS	108 444 545 101	35 520 588 69	110 538 538 0			
TYFR	108 444 440 -4	35 520 572 52	110 538 444 -94	111 445 445 0		
MH70	57 432 504 72	15 511 664 153	57 529 508 -21	58 454 504 50	59 498 498 0	
MH50	58 435 485 50	17 520 531 11	58 534 497 -37	59 462 495 33	58 497 484 -13	60 488 488 0

TABLE 5-6. 1975 OBJECTIVE TECHNIQUES FOR ALL WESTERN NORTH PACIFIC FORECASTS

24-HOUR

	JTWC	XTRP	HPAC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	301 138 138 0							
XTRP	275 137 148 10	275 148 148 0						
HPAC	235 134 144 10	234 143 144 1	235 144 144 0					
TYFC	84 128 143 15	82 150 143 -7	76 138 143 5	84 143 143 0				
TYFS	246 135 155 20	232 144 155 11	208 139 151 12	76 145 153 8	246 155 155 0			
TYFR	258 137 147 11	244 147 146 -1	223 144 144 -0	84 143 151 7	237 154 148 -6	258 147 147 0		
MH70	182 144 164 21	178 156 164 7	152 146 153 7	49 122 157 36	155 163 157 -6	168 149 160 11	182 164 164 0	
MH50	174 143 151 8	170 157 150 -7	144 146 144 -3	49 123 132 9	147 165 148 -16	160 150 150 0	173 165 151 -14	174 151 151 0

48-HOUR

	JTWC	XTRP	HPAC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	194 288 288 0							
XTRP	179 294 333 39	191 322 322 0						
HPAC	153 287 266 -21	161 292 257 -34	163 256 256 0					
TYFC	57 311 344 33	62 363 319 -44	56 251 279 28	65 317 317 0				
TYFS	178 292 372 80	173 321 363 42	152 350 343 93	64 319 429 110	187 361 361 0			
TYFR	183 297 303 6	178 319 291 -28	156 255 270 15	64 321 320 -0	184 361 293 -67	193 294 294 0		
MH70	119 306 358 52	117 344 360 16	97 266 313 47	32 341 521 180	109 391 351 -40	115 304 350 47	121 355 355 0	
MH50	116 304 349 45	114 349 347 -2	93 267 281 14	32 346 413 67	105 394 350 -45	111 306 351 45	116 360 347 -13	118 347 347 0

JTWC-OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP-12-HOUR EXTRAPOLATION
HPAC-MEAN OF XTRP AND CLIMATOLOGY
TYFC-TYFN75 (WEIGHTED CLIMO) COMBINED
~~TYFS-TYFN75 (WEIGHTED CLIMO) STRAIGHT~~
~~TYFR-TYFN75 (WEIGHTED CLIMO) RECURVE~~
MH70-MOHATT 700-MB PROG
MH50-MOHATT 500-MB PROG

72-HOUR

	JTWC	TYFC	TYFS	TYFR	MH70	MH50
JTWC	125 450 450 0					
TYFC	40 510 518 7	47 511 511 0				
TYFS	123 465 574 109	47 511 641 130	132 564 564 0			
TYFR	123 465 435 -29	47 511 513 1	132 564 435 -128	135 435 435 0		
MH70	71 465 554 89	21 543 700 157	72 583 555 -29	74 454 552 98	77 551 551 0	
MH50	71 467 499 32	23 547 530 -17	72 584 502 -82	74 458 503 45	75 547 499 -48	77 502 502 0

3. PACIFIC AREA TROPICAL STORM AND DEPRESSION DATA

TROPICAL DEPRESSION 02

1200Z 23 APR TO 0000Z 28 APR

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
231800Z	11.0N 121.8E	20	11.0N 121.0E	25	47	5	11.7N 118.7E	40	100	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240000Z	11.0N 121.5E	20	10.8N 120.5E	25	60	5	11.2N 118.7E	35	71	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240600Z	11.0N 121.1E	20	11.0N 120.9E	25	12	5	11.6N 119.3E	35	32	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241200Z	11.0N 120.7E	20	11.0N 120.4E	25	18	5	11.4N 118.1E	35	56	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	11.1N 120.3E	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	11.1N 119.9E	20	11.1N 120.0E	25	6	5	11.9N 118.4E	35	46	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	11.1N 119.5E	20	11.1N 119.7E	20	12	0	11.8N 118.2E	30	65	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	11.1N 119.0E	20	11.3N 119.2E	25	17	5	12.7N 117.0E	30	50	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	11.2N 118.4E	25	11.1N 118.6E	20	13	-5	11.7N 116.7E	20	63	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	11.4N 117.8E	25	11.1N 118.1E	20	25	-5	11.7N 116.2E	30	72	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	11.7N 117.1E	25	11.7N 116.7E	25	23	0	13.1N 114.3E	35	66	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	12.1N 116.4E	25	12.2N 116.3E	25	8	0	13.8N 114.2E	35	61	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	12.5N 116.0E	25	12.2N 115.3E	25	45	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	12.8N 115.7E	25	12.7N 115.7E	25	6	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	13.4N 115.4E	20	13.0N 115.1E	25	30	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	14.1N 115.2E	20	13.5N 114.9E	25	40	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM MAMIE

0000Z 27 JUL TO 0600Z 29 JUL

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
270000Z	22.6N 142.4E	30	22.5N 142.6E	30	13	0	23.1N 141.0E	45	153	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	23.2N 141.5E	30	22.7N 142.2E	30	49	0	24.0N 140.0E	45	135	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	23.9N 140.8E	30	22.8N 141.6E	30	79	0	24.1N 140.2E	45	205	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	24.4N 139.9E	30	24.4N 140.2E	30	16	0	26.6N 137.8E	45	144	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	24.8N 138.9E	30	24.9N 139.4E	35	28	5	26.8N 136.5E	50	166	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280600Z	25.2N 137.9E	35	25.2N 138.7E	35	43	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281200Z	25.6N 136.8E	40	25.7N 137.0E	35	12	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281800Z	26.0N 135.2E	35	26.0N 135.2E	35	0	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290000Z	27.1N 133.4E	25	26.5N 133.7E	30	39	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 05

0600Z 06 AUG TO 0000Z 07 AUG

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
060600Z	24.4N 125.5E	30	23.3N 126.5E	30	85	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	25.6N 124.3E	25	26.1N 124.3E	30	30	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	26.6N 122.9E	20	27.0N 123.4E	30	36	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	27.4N 121.4E	20	27.2N 121.5E	20	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM SUSAN

1200Z 26 AUG TO 0600Z 01 SEP

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
261200Z	26.1N 153.4E	30	25.0N 153.5E	30	66	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	27.0N 153.2E	30	25.7N 153.3E	30	78	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	28.1N 152.8E	30	27.2N 152.9E	30	54	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	29.4N 152.3E	30	28.7N 151.9E	30	47	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	30.5N 151.8E	30	30.9N 152.0E	30	26	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290000Z	35.2N 153.0E	35	35.0N 152.7E	35	19	0	38.3N 156.8E	30	87	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290600Z	35.8N 154.1E	40	35.8N 153.4E	35	34	-5	38.7N 157.9E	30	103	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291200Z	36.3N 155.3E	45	36.5N 155.0E	35	19	-10	39.2N 159.4E	30	117	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291800Z	36.7N 156.3E	50	37.7N 156.3E	35	60	-15	40.4N 163.2E	25	249	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
300000Z	36.9N 157.3E	50	36.9N 157.1E	35	10	-15	38.2N 162.3E	35	146	-5	40.0N 168.0E	30	471	0	--.- ---.-	--	--	--
300600Z	37.0N 158.2E	50	37.4N 158.2E	55	24	5	38.8N 163.3E	45	200	10	40.6N 169.5E	35	554	5	--.- ---.-	--	--	--
301200Z	37.3N 158.8E	45	37.2N 159.0E	55	11	10	37.7N 163.6E	45	247	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
301800Z	37.7N 159.1E	40	37.2N 160.2E	55	60	15	38.2N 165.5E	45	352	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310000Z	38.3N 159.2E	40	37.9N 159.2E	45	24	5	39.1N 161.4E	35	177	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310600Z	38.7N 159.0E	35	38.4N 159.0E	35	18	0	39.8N 159.0E	30	86	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311200Z	39.0N 158.6E	35	39.2N 159.0E	35	22	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	39.4N 158.1E	35	39.7N 159.0E	35	45	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	39.9N 157.7E	30	39.8N 157.3E	35	19	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	40.4N 157.3E	30	41.0N 158.2E	30	54	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM VIOLA

0000Z 05 SEP TO 0600Z 07 SEP

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
050000Z	14.9N 130.9E	30	14.8N 131.1E	30	13	0	16.1N 129.0E	40	178	0	17.6N 125.6E	50	511	20	--.- ---.-	--	--	--
050600Z	15.3N 131.1E	30	15.2N 130.7E	30	24	0	16.6N 128.7E	40	231	-5	18.5N 126.0E	50	525	20	--.- ---.-	--	--	--
051200Z	15.7N 131.3E	35	15.8N 131.2E	35	8	0	17.6N 129.5E	45	213	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051800Z	15.9N 131.6E	35	16.3N 130.8E	35	52	0	18.1N 129.2E	45	262	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	16.3N 132.1E	40	16.2N 131.8E	40	18	0	17.7N 132.9E	50	153	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060600Z	17.2N 132.7E	45	16.8N 132.5E	45	26	0	17.7N 133.8E	50	177	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	18.2N 133.2E	40	18.7N 133.0E	45	32	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	19.1N 133.7E	35	19.0N 133.3E	40	23	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	19.9N 134.3E	30	19.5N 133.9E	40	33	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	20.4N 135.1E	30	19.3N 134.2E	30	83	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM DORIS

1800Z 03 OCT TO 0000Z 06 OCT

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
031800Z	15.4N 111.2E	30	15.0N 111.8E	30	42	0	16.5N 109.8E	50	186	5	18.5N 108.3E	55	311	5	--.- ---.-	--	--	--
040000Z	16.3N 111.6E	35	15.3N 111.3E	35	62	0	17.6N 109.0E	55	215	5	20.8N 107.2E	55	330	25	--.- ---.-	--	--	--
040600Z	17.1N 111.9E	40	17.1N 111.8E	40	6	0	19.1N 110.3E	55	128	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	17.8N 112.1E	40	17.8N 111.8E	45	17	5	20.2N 112.2E	60	29	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041800Z	18.5N 112.3E	45	18.5N 112.2E	45	6	0	20.7N 113.2E	60	74	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050000Z	19.2N 112.4E	50	19.6N 112.9E	45	37	-5	22.6N 114.7E	60	112	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050600Z	19.9N 112.4E	55	19.7N 113.0E	50	36	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051200Z	20.6N 112.5E	55	20.7N 113.0E	50	29	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051800Z	21.8N 112.6E	50	21.5N 112.5E	50	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	22.9N 112.7E	30	23.0N 113.0E	40	18	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 18

0600Z 15 OCT TO 0600Z 17 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
150600Z	13.2N 136.7E	30	13.0N 136.0E	30	42	0	13.2N 130.0E	45	145	25	13.7N 124.2E	60	374	35	--.- ---.-	--	--	--
151200Z	13.3N 135.6E	25	13.0N 135.1E	30	34	5	13.1N 130.1E	40	120	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	13.7N 134.5E	25	13.0N 133.6E	30	67	5	13.1N 128.8E	40	179	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	13.8N 133.2E	20	13.4N 132.8E	25	33	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	13.9N 132.4E	20	13.5N 131.3E	20	68	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	14.1N 131.9E	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	14.1N 131.7E	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	14.1N 131.4E	25	14.3N 131.6E	30	17	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	14.5N 130.6E	25	14.5N 130.8E	25	12	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM GRACE

0000Z 25 OCT TO 0600Z 02 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
250000Z	18.0N 128.4E	40	18.0N 128.5E	40	6	0	17.2N 124.2E	60	268	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	17.9N 127.9E	45	17.7N 127.7E	45	16	0	16.6N 123.5E	60	342	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	18.0N 127.6E	50	18.1N 127.9E	45	18	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	18.5N 127.9E	40	18.5N 128.1E	35	11	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	18.8N 128.6E	30	18.9N 128.5E	30	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	18.9N 129.0E	25	19.0N 129.3E	30	18	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	17.9N 132.0E	30	18.3N 132.2E	30	26	0	17.8N 134.2E	35	311	5	17.9N 136.3E	40	405	5	18.4N 138.4E	45	500	-15
280600Z	18.4N 132.1E	30	18.2N 132.2E	30	13	0	18.0N 133.0E	35	268	5	18.0N 135.1E	40	324	0	18.2N 137.2E	45	436	-5
281200Z	18.1N 131.1E	30	18.2N 131.1E	30	6	0	17.7N 129.8E	35	72	5	17.6N 128.9E	40	149	-5	17.5N 128.1E	45	393	0
281800Z	17.9N 129.7E	30	18.1N 129.8E	25	13	-5	17.9N 127.7E	35	72	0	17.8N 126.8E	40	251	-10	17.7N 126.0E	45	518	0
290000Z	17.1N 128.8E	30	16.8N 128.2E	30	39	0	16.0N 124.1E	40	330	5	15.8N 120.6E	25	647	-35	--.- ---.-	--	--	--
290600Z	17.7N 128.3E	30	16.9N 127.4E	30	70	0	16.4N 124.2E	45	342	5	15.9N 120.8E	25	692	-25	--.- ---.-	--	--	--
291200Z	18.1N 128.6E	30	17.9N 128.8E	30	16	0	17.0N 129.1E	45	181	0	16.9N 128.3E	45	419	0	17.2N 127.6E	45	733	-10
291800Z	18.3N 128.9E	35	18.2N 128.6E	30	18	-5	19.6N 128.8E	45	98	-5	20.4N 128.9E	50	289	5	21.2N 129.1E	55	627	0
300000Z	18.6N 129.2E	35	18.4N 128.5E	35	41	0	19.7N 128.5E	50	153	-10	20.6N 128.5E	55	361	10	21.4N 128.7E	60	724	10
300600Z	19.1N 129.5E	40	18.5N 128.8E	35	53	-5	19.5N 129.2E	50	203	0	20.5N 129.7E	55	397	5	21.6N 130.1E	60	708	15
301200Z	20.0N 129.6E	45	19.2N 129.6E	35	48	-10	21.1N 131.1E	45	128	0	23.2N 132.9E	50	269	-5	--.- ---.-	--	--	--
301800Z	21.0N 129.7E	50	21.4N 129.7E	60	24	10	26.3N 133.0E	70	146	25	29.4N 139.4E	60	131	5	--.- ---.-	--	--	--
310000Z	21.7N 130.2E	60	21.9N 129.8E	60	25	0	25.7N 132.2E	70	100	25	29.2N 138.6E	60	152	10	--.- ---.-	--	--	--
310600Z	22.5N 130.9E	50	21.9N 130.3E	60	49	10	23.9N 131.9E	55	176	5	26.8N 136.1E	45	324	0	--.- ---.-	--	--	--
311200Z	23.2N 131.6E	45	23.5N 131.8E	55	21	10	27.0N 136.3E	50	50	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	23.9N 132.5E	45	23.8N 132.2E	55	17	10	26.7N 135.7E	45	150	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	24.5N 133.5E	45	24.4N 133.5E	45	6	0	26.8N 137.9E	40	135	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	25.2N 134.8E	50	25.1N 134.7E	45	8	-5	28.2N 140.5E	40	152	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	26.2N 136.6E	55	26.8N 137.3E	45	52	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	27.4N 138.4E	55	26.4N 138.0E	45	63	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	27.2N 140.4E	50	27.7N 140.8E	45	37	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	26.1N 142.1E	45	27.5N 142.3E	45	84	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM HELEN

0600Z 03 NOV TO 1200Z 04 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
030600Z	13.7N 114.4E	35	14.0N 115.0E	35	39	0	14.2N 110.8E	50	101	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	13.9N 113.1E	40	14.0N 113.2E	35	8	-5	14.3N 108.3E	35	84	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	13.3N 112.1E	45	14.0N 111.9E	35	43	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	12.9N 111.0E	40	13.2N 111.2E	35	21	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	12.9N 109.7E	30	12.6N 109.9E	30	21	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	12.9N 108.3E	25	13.0N 107.8E	25	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 24

0000Z 27 DEC TO 0000Z 28 DEC

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
270000Z	13.6N 124.5E	30	13.2N 124.6E	30	25	0	15.6N 123.2E	35	128	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	14.1N 123.5E	30	12.8N 124.2E	30	88	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	14.4N 122.3E	30	14.2N 122.7E	30	26	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	14.1N 121.6E	30	14.4N 122.2E	25	39	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	14.5N 121.3E	25	14.5N 121.1E	25	12	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 25

0000Z 27 DEC TO 0600Z 29 DEC

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
270000Z	11.2N 114.5E	30	11.2N 114.3E	30	12	0	11.2N 114.3E	40	117	10	12.1N 115.2E	45	232	20	--.- ---.-	--	--	--
270600Z	10.9N 114.9E	30	11.3N 114.6E	30	30	0	12.4N 115.4E	40	180	10	13.4N 115.9E	45	310	20	--.- ---.-	--	--	--
271200Z	10.6N 115.3E	30	11.1N 114.9E	30	38	0	11.9N 115.6E	40	174	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	10.3N 115.5E	30	9.5N 115.0E	30	56	0	7.9N 115.4E	20	72	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	9.8N 115.7E	30	9.4N 115.8E	30	25	0	7.5N 116.3E	20	64	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280600Z	9.4N 115.7E	30	9.2N 115.4E	30	21	0	8.3N 115.2E	20	124	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281200Z	9.0N 115.9E	30	9.3N 115.9E	30	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281800Z	8.7N 116.3E	30	8.8N 115.4E	30	53	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290000Z	8.5N 116.7E	25	9.0N 116.2E	30	42	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290600Z	8.4N 117.3E	25	8.6N 117.8E	25	32	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

4. PACIFIC AREA TYPHOON DATA

TYPHOON LOLA

0600Z 22 JAN TO 0600Z 28 JAN

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
220600Z	7.4N 135.2E	40	7.5N 134.8E	40	24	0	8.6N 131.3E	50	89	-5	9.7N 127.8E	60	95	-5	10.6N 124.3E	35	346	-5
221200Z	7.7N 134.9E	40	7.3N 134.8E	40	25	0	8.3N 132.4E	40	56	-20	9.4N 128.7E	50	233	0	10.0N 125.5E	40	517	-5
221800Z	7.9N 134.4E	45	7.7N 134.4E	40	12	-5	9.1N 132.2E	40	143	-25	10.7N 128.7E	55	352	15	11.3N 124.9E	40	558	-10
230000Z	8.1N 134.0E	50	8.0N 133.9E	50	8	0	9.5N 131.1E	60	191	-10	10.9N 128.2E	70	469	30	12.3N 125.4E	60	658	10
230600Z	8.4N 132.8E	55	8.4N 133.4E	55	35	0	10.2N 130.5E	65	256	0	11.4N 127.6E	75	533	35	12.7N 124.7E	50	700	0
231200Z	8.6N 131.5E	60	9.0N 132.0E	60	38	0	10.7N 128.3E	70	209	20	11.9N 125.2E	60	479	15	13.0N 122.2E	35	568	-15
231800Z	8.8N 129.8E	65	9.1N 130.1E	65	25	0	9.9N 125.3E	50	160	10	9.9N 121.6E	40	402	-10	9.4N 118.0E	40	509	-5
240000Z	9.0N 127.9E	70	8.9N 128.1E	70	13	0	8.9N 122.2E	35	185	-5	9.4N 117.0E	45	310	-5	10.7N 112.7E	45	347	5
240600Z	9.1N 126.3E	65	9.0N 126.8E	70	30	5	9.0N 121.3E	35	230	-5	9.4N 116.2E	45	369	-5	10.9N 111.9E	45	361	15
241200Z	10.1N 124.8E	50	9.9N 124.8E	45	12	-5	12.6N 119.7E	35	158	-10	15.3N 116.2E	35	202	-15	18.7N 114.0E	25	159	-5
241800Z	10.7N 122.7E	40	10.4N 123.2E	40	34	0	13.5N 118.1E	35	154	-15	16.6N 114.6E	30	118	-15	20.4N 113.7E	25	278	-5
250000Z	11.3N 120.2E	40	11.2N 120.2E	40	6	0	13.6N 113.6E	45	37	-5	17.4N 112.0E	35	58	-5	--.- ---.-	--	--	--
250600Z	11.7N 118.5E	40	11.7N 118.8E	40	18	0	14.2N 113.7E	45	57	-5	17.4N 111.2E	35	85	5	--.- ---.-	--	--	--
251200Z	12.3N 117.0E	45	12.3N 117.1E	45	6	0	14.9N 111.9E	40	55	-10	17.9N 109.2E	30	227	0	--.- ---.-	--	--	--
251800Z	13.0N 115.5E	50	13.0N 115.1E	45	23	-5	15.5N 109.5E	35	182	-10	19.2N 106.5E	25	417	-5	--.- ---.-	--	--	--
260000Z	13.8N 114.2E	50	13.9N 114.0E	50	13	0	18.1N 109.9E	35	172	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	14.6N 112.8E	50	14.7N 112.5E	45	18	-5	18.6N 107.5E	25	307	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	15.4N 112.7E	50	15.3N 112.9E	40	13	-10	19.5N 113.5E	30	195	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	16.1N 112.6E	45	16.4N 112.9E	40	25	-5	21.0N 114.6E	35	325	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	16.5N 112.4E	40	16.7N 112.3E	35	13	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	16.9N 112.6E	30	16.9N 112.2E	50	23	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	16.3N 112.8E	30	16.8N 112.6E	50	32	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	15.8N 112.9E	30	16.0N 112.7E	40	17	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	146NM	302NM	525NM	20NM	166NM	290NM	455NM
AVERAGE RIGHT ANGLE ERROR	12NM	70NM	103NM	107NM	12NM	98NM	125NM	129NM
AVERAGE MAGNITUDE OF WIND ERROR	2KTS	10KTS	13KTS	7KTS	4KTS	9KTS	11KTS	7KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	-6KTS	3KTS	-3KTS	1KTS	-5KTS	2KTS	-2KTS
NUMBER OF FORECASTS	20	16	12	8	23	19	15	11

TYPHOON NINA

1200Z 31 JUL TO 0000Z 04 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
311200Z	17.7N 133.2E	30	17.6N 133.0E	30	13	0	17.4N 131.6E	45	179	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	17.9N 132.8E	35	17.9N 132.8E	30	0	-5	18.3N 130.9E	50	183	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	18.4N 132.4E	40	18.0N 132.2E	50	26	10	18.7N 129.6E	70	289	-20	20.3N 126.3E	85	304	-20	22.6N 123.0E	95	424	60
010600Z	19.3N 131.7E	50	19.1N 131.8E	50	13	0	21.0N 129.7E	75	194	-50	22.9N 127.3E	85	367	20	--.- ---.-	--	--	--
011200Z	20.3N 130.8E	60	20.1N 130.7E	60	13	0	23.2N 127.4E	90	127	-45	26.1N 124.3E	105	269	45	--.- ---.-	--	--	--
011800Z	21.1N 129.6E	75	21.1N 129.6E	70	0	-5	25.0N 125.5E	105	145	-10	28.3N 121.6E	90	272	40	--.- ---.-	--	--	--
020000Z	21.9N 128.1E	90	22.4N 128.3E	80	32	-10	26.6N 123.6E	105	181	0	29.5N 119.4E	30	284	-5	--.- ---.-	--	--	--
020600Z	22.5N 126.6E	125	22.8N 126.5E	100	19	-25	25.7N 121.0E	100	78	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	23.0N 125.1E	135	23.3N 125.3E	130	21	-5	24.5N 120.3E	90	38	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	23.3N 123.6E	115	23.3N 123.6E	135	0	20	23.8N 117.5E	45	79	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	23.8N 122.3E	105	23.6N 122.5E	120	16	15	24.6N 117.4E	45	73	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	24.4N 120.8E	65	24.5N 121.0E	70	12	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	24.6N 119.6E	60	24.4N 119.6E	70	12	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	25.0N 118.1E	50	25.0N 118.6E	55	27	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	25.5N 116.5E	35	25.3N 117.0E	30	30	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	16NM	135NM	299NM	424NM	16NM	135NM	299NM	424NM
AVERAGE RIGHT ANGLE ERROR	11NM	75NM	170NM	41NM	11NM	75NM	170NM	41NM
AVERAGE MAGNITUDE OF WIND ERROR	9KTS	22KTS	26KTS	60KTS	8KTS	22KTS	26KTS	60KTS
AVERAGE BIAS OF WIND ERROR	1KTS	-9KTS	16KTS	60KTS	1KTS	-9KTS	16KTS	60KTS
NUMBER OF FORECASTS	14	11	5	1	15	11	5	1

TYPHOON ORA

0600Z 10 AUG TO 1200Z 12 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
100600Z	21.9N 124.9E	40	21.8N 124.9E	40	6	0	24.4N 122.3E	50	169	-15	27.4N 121.1E	55	32	-5	--.- ---.-	--	--	--
101200Z	22.3N 124.9E	50	22.4N 124.8E	50	8	0	24.1N 122.9E	65	161	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	22.9N 124.9E	55	23.2N 125.0E	60	19	5	26.2N 125.0E	75	76	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	23.7N 125.2E	60	23.9N 125.3E	65	13	5	26.8N 125.7E	85	163	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110600Z	24.7N 125.4E	65	24.5N 125.5E	70	13	5	27.3N 126.3E	85	267	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111200Z	26.0N 125.0E	65	25.9N 125.3E	70	17	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111800Z	27.1N 124.0E	65	27.1N 124.2E	70	11	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120000Z	27.7N 122.8E	65	27.2N 123.8E	60	61	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120600Z	27.9N 121.3E	60	28.3N 122.1E	50	48	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	167NM	32NM	0NM	22NM	167NM	32NM	0NM
AVERAGE RIGHT ANGLE ERROR	8NM	92NM	31NM	0NM	8NM	92NM	31NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	14KTS	5KTS	0KTS	4KTS	14KTS	5KTS	0KTS
AVERAGE BIAS OF WIND ERROR	1KTS	8KTS	-5KTS	0KTS	1KTS	8KTS	-5KTS	0KTS
NUMBER OF FORECASTS	9	5	1	0	9	5	1	0

TYPHOON PHYLLIS

0000Z 12 AUG TO 1200Z 18 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
120000Z	12.6N 138.0E	30	12.7N 137.9E	30	8	0	14.3N 134.2E	40	134	-5	16.2N 130.5E	50	397	-40	18.0N 127.3E	65	719	-50
120600Z	13.0N 137.6E	35	13.1N 137.1E	35	30	0	14.9N 133.5E	50	168	-5	17.0N 130.0E	65	445	-35	18.9N 126.8E	75	743	-35
121200Z	13.4N 137.2E	35	13.7N 137.0E	35	21	0	16.1N 134.4E	50	124	-20	18.5N 131.1E	65	397	-45	20.9N 127.6E	75	631	-30
121800Z	13.8N 136.8E	40	14.1N 136.6E	40	21	0	16.5N 134.0E	55	162	-25	19.1N 130.8E	70	460	-50	21.5N 127.4E	80	611	-20
130000Z	14.1N 136.5E	45	14.6N 136.0E	45	42	0	16.7N 133.0E	65	254	-25	18.8N 129.4E	75	600	-40	20.3N 125.6E	80	739	-20
130600Z	14.8N 136.4E	55	14.5N 136.1E	50	25	-5	16.4N 133.5E	75	310	-25	18.5N 130.0E	80	646	-30	20.1N 126.2E	90	739	-5
131200Z	15.6N 136.5E	70	15.7N 136.5E	60	6	-10	18.6N 134.8E	80	248	-30	21.7N 132.4E	85	440	-20	24.4N 129.4E	90	450	0
131800Z	16.9N 136.8E	80	16.6N 136.5E	70	25	-10	20.4N 135.2E	85	245	-35	23.1N 132.1E	90	387	-10	25.0N 128.5E	95	467	10
140000Z	18.6N 137.0E	90	18.5N 137.0E	85	6	-5	23.7N 135.8E	105	149	-10	27.9N 132.7E	105	143	5	31.3N 129.9E	95	160	15
140600Z	20.4N 137.0E	100	20.2N 137.0E	100	12	0	26.0N 135.4E	120	109	10	31.8N 132.0E	100	144	5	35.5N 130.8E	50	110	-10
141200Z	22.2N 137.0E	110	22.2N 137.0E	110	0	0	29.2N 135.9E	115	48	10	34.8N 133.4E	60	233	-30	38.6N 133.8E	40	266	-10
141800Z	24.1N 137.1E	120	24.2N 137.0E	115	8	-5	30.6N 136.1E	110	109	10	34.8N 134.3E	60	195	-25	38.4N 135.7E	40	307	0
150000Z	25.9N 137.1E	115	26.0N 137.0E	115	8	0	34.3N 135.8E	70	283	-30	40.5N 136.7E	50	506	-30	--.- ---.-	--	--	--
150600Z	27.4N 136.7E	110	27.5N 137.0E	110	17	0	34.7N 134.2E	70	269	-25	40.4N 138.3E	40	493	-20	--.- ---.-	--	--	--
151200Z	28.4N 135.8E	105	28.6N 135.7E	100	13	-5	33.4N 132.0E	70	172	-20	38.7N 135.4E	45	317	-5	--.- ---.-	--	--	--
151800Z	29.0N 135.1E	100	29.2N 134.7E	100	24	0	33.2N 130.3E	60	167	-25	38.2N 134.2E	40	243	0	--.- ---.-	--	--	--
160000Z	29.7N 134.5E	100	29.8N 134.2E	100	17	0	33.2N 130.9E	55	90	-25	38.0N 134.0E	45	202	10	--.- ---.-	--	--	--
160600Z	30.2N 134.1E	95	30.1N 133.9E	100	12	5	32.7N 131.2E	55	80	-6	37.3N 132.9E	45	123	15	--.- ---.-	--	--	--
161200Z	30.9N 133.7E	90	30.9N 133.8E	90	5	0	34.4N 133.5E	55	130	5	39.7N 136.3E	40	297	15	--.- ---.-	--	--	--
161800Z	31.7N 133.1E	85	31.8N 133.2E	85	8	0	35.5N 132.7E	55	112	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	32.7N 132.6E	80	32.7N 132.8E	85	10	5	36.5N 133.0E	45	126	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	33.9N 131.9E	60	34.3N 131.9E	65	24	5	39.8N 133.4E	30	228	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171200Z	34.8N 130.9E	50	34.8N 130.9E	55	0	5	38.3N 128.6E	30	106	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171800Z	35.5N 130.4E	40	35.4N 130.0E	50	20	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180000Z	36.2N 130.4E	35	36.6N 130.4E	40	24	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180600Z	36.8N 130.4E	30	37.8N 130.1E	35	61	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181200Z	37.5N 130.6E	25	38.8N 130.0E	25	83	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	16NM	166NM	368NM	495NM	20NM	166NM	351NM	495NM
AVERAGE RIGHT ANGLE ERROR	9NM	111NM	263NM	403NM	12NM	114NM	257NM	403NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	18KTS	24KTS	17KTS	3KTS	16KTS	23KTS	17KTS
AVERAGE BIAS OF WIND ERROR	-0KTS	-12KTS	-21KTS	-13KTS	0KTS	-11KTS	-17KTS	-13KTS
NUMBER OF FORECASTS	24	21	17	12	27	23	19	12

TYPHOON RITA

0600Z 18 AUG TO 1800Z 23 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
180600Z	24.7N 130.6E	25	24.7N 130.6E	30	0	5	26.3N 131.5E	45	89	10	28.4N 132.8E	50	247	5	31.5N 133.9E	50	197	-15
181200Z	24.8N 130.9E	30	25.1N 131.0E	30	19	0	26.4N 131.5E	45	110	5	28.5N 132.2E	50	188	0	31.0N 132.0E	50	96	-20
181800Z	25.4N 131.2E	30	25.0N 131.0E	30	26	0	26.0N 131.0E	40	98	0	28.0N 130.3E	45	49	-10	29.8N 129.8E	50	156	-20
190000Z	25.8N 130.4E	35	26.0N 130.6E	35	16	0	28.0N 130.2E	45	127	0	30.4N 129.5E	45	161	-15	32.6N 128.7E	40	260	-35
190600Z	25.9N 129.9E	35	25.8N 130.6E	35	38	0	27.5N 130.1E	45	95	0	29.7N 129.5E	45	127	-20	32.3N 129.5E	40	225	-35
191200Z	26.0N 129.5E	40	25.9N 130.1E	40	33	0	27.3N 129.4E	50	32	0	29.6N 128.4E	50	198	-20	31.5N 126.8E	45	393	-35
191800Z	26.3N 129.2E	40	26.2N 129.1E	40	8	0	27.4N 127.1E	50	181	-5	28.7N 124.9E	50	418	-20	29.9N 122.5E	45	675	-25
200000Z	26.5N 128.5E	45	26.5N 128.8E	45	16	0	28.2N 126.9E	40	232	-20	30.3N 124.8E	35	438	-40	32.6N 123.1E	35	652	-20
200600Z	26.8N 128.5E	45	27.0N 128.2E	45	20	0	28.8N 126.1E	40	293	-25	31.2N 124.5E	35	480	-40	33.8N 123.6E	35	726	-15
201200Z	26.8N 129.2E	50	26.9N 128.6E	45	33	-5	28.2N 127.4E	50	261	-20	30.4N 125.5E	50	476	-30	32.7N 123.7E	45	950	15
201800Z	27.2N 130.5E	55	27.4N 128.8E	45	91	-10	28.6N 127.9E	50	269	-20	30.4N 126.7E	50	470	-20	--.- ---.-	--	--	--
210000Z	28.2N 131.3E	60	28.5N 131.5E	55	21	-5	32.6N 135.5E	60	159	-15	37.2N 141.8E	40	303	-15	--.- ---.-	--	--	--
210600Z	28.8N 131.7E	65	28.4N 131.9E	65	26	0	31.0N 134.9E	65	70	-10	34.9N 138.2E	60	150	10	--.- ---.-	--	--	--
211200Z	29.4N 132.2E	70	29.5N 132.2E	65	6	-5	32.8N 134.5E	65	8	-15	36.5N 138.2E	50	255	20	--.- ---.-	--	--	--
211800Z	30.0N 132.8E	70	30.1N 132.9E	65	8	-5	33.0N 134.9E	65	78	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	30.7N 133.3E	75	30.6N 133.4E	70	8	-5	35.5N 137.5E	50	91	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	31.8N 133.9E	75	31.8N 133.7E	75	10	0	37.5N 139.0E	45	53	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	32.9N 134.4E	80	32.9N 134.2E	75	10	-5	38.1N 140.0E	35	129	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	34.3N 134.8E	70	34.4N 135.0E	65	12	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	35.9N 135.7E	55	35.8N 136.0E	45	16	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	37.4N 137.9E	50	37.7N 137.5E	45	26	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	40.0N 141.3E	30	39.8N 140.6E	35	34	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	132NM	285NM	376NM	22NM	132NM	283NM	433NM
AVERAGE RIGHT ANGLE ERROR	12NM	68NM	177NM	259NM	12NM	66NM	168NM	280NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	9KTS	19KTS	24KTS	3KTS	9KTS	19KTS	24KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-8KTS	-17KTS	-24KTS	-2KTS	-7KTS	-14KTS	-21KTS
NUMBER OF FORECASTS	18	17	13	9	22	18	14	10

TYPHOON TESS

0000Z 02 SEP TO 0000Z 10 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
020000Z	18.0N 150.6E	30	17.8N 150.2E	35	26	5	18.4N 146.7E	55	160	5	18.9N 143.2E	65	352	-15	19.4N 139.7E	80	491	-15
020600Z	18.3N 150.4E	35	18.2N 149.8E	35	35	0	19.1N 147.0E	55	139	0	19.9N 144.2E	70	259	-15	20.5N 141.2E	85	385	-5
021200Z	18.4N 150.3E	40	18.8N 149.7E	40	42	0	19.7N 147.4E	60	114	-5	20.5N 144.4E	70	225	-20	21.2N 141.1E	85	372	-5
021800Z	18.7N 149.8E	45	18.6N 148.8E	45	57	0	19.8N 146.3E	65	172	-10	20.8N 143.0E	80	287	-15	21.2N 139.2E	90	456	5
030000Z	19.2N 149.4E	50	19.3N 148.2E	50	68	0	20.1N 145.9E	70	185	-10	20.8N 142.5E	80	314	-15	21.0N 139.1E	90	485	5
030600Z	19.6N 149.4E	55	19.6N 149.1E	60	17	5	21.0N 147.1E	70	83	-15	22.0N 144.3E	80	203	-10	22.6N 141.0E	90	378	5
031200Z	20.0N 149.4E	65	19.9N 149.0E	70	23	5	21.2N 147.9E	90	60	0	22.4N 146.2E	105	198	15	23.3N 143.8E	100	292	20
031800Z	20.4N 149.3E	75	20.4N 149.5E	70	11	-5	21.8N 148.9E	90	101	-5	22.9N 147.1E	100	223	15	23.9N 145.0E	90	271	10
040000Z	20.9N 149.1E	80	20.7N 149.3E	80	16	0	22.0N 147.9E	90	122	-5	23.1N 145.9E	100	230	15	24.1N 143.7E	90	301	10
040600Z	21.5N 148.5E	85	21.5N 148.9E	80	22	-5	23.1N 147.6E	90	121	0	24.2N 145.4E	100	197	15	24.7N 142.9E	90	313	15
041200Z	22.2N 148.0E	90	22.3N 148.1E	90	8	0	24.1N 145.8E	110	96	20	25.3N 143.1E	110	199	30	25.8N 140.0E	100	394	30
041800Z	23.0N 147.6E	95	23.0N 147.5E	95	5	0	25.2N 145.0E	115	69	30	26.2N 141.7E	115	245	35	27.4N 138.3E	105	448	35
050000Z	23.9N 147.1E	95	23.8N 147.0E	95	8	0	26.5N 144.8E	105	32	20	29.2N 142.1E	110	206	30	31.3N 139.9E	105	366	40
050600Z	24.8N 146.4E	90	24.8N 146.4E	95	0	5	27.8N 144.1E	80	61	-5	30.4N 141.5E	75	270	0	32.8N 139.6E	70	409	5
051200Z	25.7N 145.8E	90	25.7N 145.7E	90	5	0	29.2N 143.2E	80	131	0	32.2N 141.0E	75	341	5	35.0N 139.4E	70	482	5
051800Z	26.3N 145.4E	85	26.4N 145.2E	90	12	5	29.5N 143.1E	80	146	0	32.5N 140.8E	75	360	5	35.8N 139.0E	65	519	5
060000Z	26.9N 145.2E	85	27.0N 145.1E	90	8	5	30.4N 143.9E	80	149	0	33.5N 142.9E	70	314	5	36.6N 142.6E	60	367	10
060600Z	27.5N 145.2E	85	27.6N 145.0E	90	12	5	30.9N 144.5E	80	155	5	34.1N 144.5E	70	282	5	37.1N 145.5E	65	250	15
061200Z	28.0N 145.3E	80	28.1N 145.1E	90	12	10	31.0N 145.1E	85	140	15	34.1N 145.7E	70	239	5	--.- ---.-	--	--	--
061800Z	28.4N 145.6E	60	28.9N 145.3E	80	34	0	32.2N 146.3E	70	186	0	34.8N 148.5E	65	237	5	--.- ---.-	--	--	--
070000Z	28.7N 146.0E	80	28.8N 145.7E	80	17	0	30.7N 146.7E	70	84	5	33.3N 148.5E	60	75	10	--.- ---.-	--	--	--
070600Z	28.9N 146.4E	75	29.2N 145.8E	75	36	0	29.9N 146.2E	65	32	0	32.3N 147.8E	55	91	5	--.- ---.-	--	--	--
071200Z	29.0N 146.5E	70	29.1N 146.2E	65	17	-5	30.1N 147.4E	65	16	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	29.1N 146.6E	70	29.2N 146.5E	65	8	-5	30.0N 147.7E	60	54	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	29.3N 146.6E	65	29.3N 146.8E	65	10	0	29.5N 147.3E	50	163	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080600Z	29.8N 146.8E	65	29.8N 146.9E	65	5	0	30.7N 148.1E	50	180	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081200Z	30.3N 147.2E	65	30.1N 147.3E	40	13	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081800Z	30.9N 147.6E	60	30.9N 147.5E	65	5	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090000Z	32.2N 147.8E	50	31.5N 148.1E	50	44	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	33.7N 148.5E	50	33.2N 148.0E	50	39	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	113NM	243NM	387NM	21NM	113NM	243NM	387NM
AVERAGE RIGHT ANGLE ERROR	14NM	78NM	180NM	330NM	15NM	78NM	180NM	330NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	6KTS	13KTS	13KTS	3KTS	6KTS	13KTS	13KTS
AVERAGE BIAS OF WIND ERROR	0KTS	2KTS	5KTS	11KTS	0KTS	2KTS	5KTS	11KTS
NUMBER OF FORECASTS	29	26	22	18	30	26	22	18

TYPHOON WINNIE

0000Z 09 SEP TO 0000Z 12 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
090000Z	25.8N 164.0E	40	25.8N 163.9E	30	5	-10	27.7N 164.2E	40	151	-25	29.7N 164.6E	45	315	-10	--.- ---.-	--	--	--
090600Z	26.9N 164.0E	50	26.5N 164.2E	35	26	-15	29.6N 164.7E	45	129	-20	33.1N 165.6E	55	236	5	--.- ---.-	--	--	--
091200Z	28.0N 163.7E	60	27.8N 164.1E	45	24	-15	31.7N 163.5E	55	55	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	29.0N 163.4E	65	26.8N 164.0E	50	34	-15	32.8N 163.5E	60	67	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	30.0N 163.0E	65	30.1N 162.7E	65	17	0	34.0N 160.4E	65	116	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	31.0N 162.8E	65	31.2N 162.2E	65	33	0	35.2N 160.4E	65	194	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	32.2N 162.6E	65	32.2N 162.8E	65	10	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	33.3N 162.3E	65	33.3N 162.9E	65	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	34.7N 162.6E	55	34.7N 162.5E	55	5	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110600Z	36.8N 163.9E	50	36.5N 163.3E	50	34	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	119NM	276NM	0NM	22NM	119NM	276NM	0NM
AVERAGE RIGHT ANGLE ERROR	16NM	67NM	115NM	0NM	16NM	67NM	115NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	14KTS	8KTS	0KTS	6KTS	14KTS	8KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-6KTS	-6KTS	-3KTS	0KTS	-6KTS	-6KTS	-3KTS	0KTS
NUMBER OF FORECASTS	10	6	2	0	10	6	2	0

TYPHOON ALICE

0000Z 16 SEP TO 0600Z 20 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
160000Z	13.8N 129.4E	30	13.8N 129.7E	30	17	0	16.0N 127.4E	45	144	-10	17.9N 124.3E	60	242	-5	19.5N 120.5E	70	375	10
160600Z	13.9N 128.4E	35	13.9N 128.4E	35	0	0	15.9N 125.7E	50	102	-15	18.1N 122.8E	60	254	-5	20.1N 119.7E	70	415	10
161200Z	14.1N 127.4E	40	14.2N 127.6E	35	13	-5	16.2N 124.4E	55	89	-20	17.9N 121.3E	60	252	0	19.7N 118.1E	65	394	5
161800Z	14.3N 126.4E	45	14.4N 126.5E	45	8	0	16.1N 122.8E	65	47	-10	17.3N 118.9E	55	189	-5	18.6N 115.9E	65	277	10
170000Z	14.7N 125.3E	55	14.7N 125.3E	45	0	-10	16.2N 120.8E	50	24	-15	17.6N 116.8E	60	144	0	18.9N 113.3E	65	254	15
170600Z	15.0N 124.2E	65	14.9N 124.3E	60	8	-5	16.1N 120.4E	50	109	-15	17.5N 116.5E	65	211	5	19.1N 113.4E	70	333	30
171200Z	15.4N 123.1E	75	15.3N 123.3E	65	13	-10	16.9N 119.4E	55	137	-5	17.8N 115.7E	65	251	5	18.6N 112.1E	70	337	35
171800Z	15.9N 122.0E	75	15.8N 122.2E	75	13	0	17.2N 118.2E	65	149	5	18.0N 114.5E	70	202	15	--.- ---.-	--	--	--
180000Z	16.3N 120.4E	65	16.1N 121.0E	65	36	0	17.3N 116.8E	75	143	15	18.3N 113.2E	75	252	25	--.- ---.-	--	--	--
180600Z	16.7N 118.6E	65	16.7N 119.1E	65	29	0	17.9N 114.8E	75	114	15	18.8N 110.7E	65	183	25	--.- ---.-	--	--	--
181200Z	16.9N 117.0E	60	16.9N 116.8E	65	11	5	17.9N 110.8E	70	34	10	18.1N 104.6E	40	119	5	--.- ---.-	--	--	--
181800Z	17.0N 115.6E	60	16.8N 116.0E	55	26	-5	16.8N 111.1E	45	108	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	17.3N 114.3E	60	17.1N 114.9E	55	36	-5	17.1N 110.0E	45	127	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	17.7N 112.8E	60	17.6N 112.9E	55	8	-5	17.8N 106.7E	40	100	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	18.2N 111.3E	60	18.1N 111.0E	60	18	0	20.3N 104.9E	25	91	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	18.6N 111.0E	55	19.1N 109.6E	50	85	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	18.9N 108.8E	50	19.2N 108.5E	50	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	19.3N 107.5E	40	19.9N 107.1E	40	42	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	19.4N 106.2E	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	101NM	209NM	341NM	22NM	101NM	209NM	341NM
AVERAGE RIGHT ANGLE ERROR	10NM	54NM	71NM	125NM	10NM	54NM	71NM	125NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	11KTS	9KTS	16KTS	3KTS	11KTS	9KTS	16KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-5KTS	6KTS	16KTS	-3KTS	-5KTS	6KTS	16KTS
NUMBER OF FORECASTS	17	15	11	7	18	15	11	7

TYPHOON BETTY

0600Z 17 SEP TO 1200Z 23 SEP

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
170600Z	16.2N 143.7E	30	16.3N 143.7E	25	6	-5	17.1N 139.6E	35	81	0	17.7N 135.4E	50	83	5	18.1N 131.2E	65	168	5
171200Z	16.7N 142.0E	30	16.5N 142.0E	25	12	-5	17.0N 138.0E	35	24	0	17.3N 133.9E	50	126	5	17.6N 129.8E	65	223	0
171800Z	16.9N 140.7E	30	16.9N 141.1E	25	23	-5	17.7N 137.0E	35	54	-5	18.3N 132.9E	50	147	0	18.8N 128.6E	65	192	-5
180000Z	17.0N 139.4E	35	16.9N 139.8E	35	24	0	17.7N 135.2E	55	103	15	18.4N 130.2E	70	248	15	19.0N 125.2E	85	282	10
180600Z	16.9N 138.2E	35	17.1N 137.9E	35	21	0	18.2N 132.5E	55	237	10	18.8N 127.1E	75	362	15	19.7N 121.5E	80	376	0
181200Z	16.9N 137.6E	35	17.1N 137.2E	40	26	5	17.6N 133.1E	60	173	15	18.0N 128.5E	75	255	10	19.2N 123.3E	65	261	0
181800Z	16.8N 137.1E	40	16.8N 137.1E	40	0	0	16.6N 134.2E	60	126	10	17.0N 130.6E	75	263	5	17.6N 126.5E	85	321	-5
190000Z	16.6N 136.6E	40	16.7N 136.6E	45	6	5	16.9N 133.0E	65	162	10	17.3N 128.6E	75	282	0	17.9N 124.4E	90	284	-5
190600Z	16.6N 136.3E	45	16.8N 135.6E	50	42	5	17.0N 132.2E	65	192	5	17.4N 127.9E	80	299	0	18.2N 123.7E	90	276	-5
191200Z	17.2N 136.1E	45	16.8N 135.6E	50	37	5	16.7N 133.4E	65	252	0	16.8N 130.1E	85	418	0	17.2N 126.0E	95	448	20
191800Z	18.3N 135.5E	50	18.1N 135.5E	50	12	0	18.1N 133.4E	70	252	0	18.1N 130.1E	85	408	-5	18.5N 126.0E	95	422	30
200000Z	19.2N 134.5E	55	19.4N 134.5E	55	12	0	20.8N 130.4E	75	102	0	22.0N 126.2E	90	148	-5	23.2N 122.1E	100	171	40
200600Z	20.0N 133.4E	60	20.0N 133.5E	55	6	-5	22.4N 129.5E	80	105	0	23.9N 125.6E	100	202	5	25.2N 121.5E	90	216	35
201200Z	20.7N 132.0E	65	20.5N 132.2E	60	16	-5	22.3N 127.9E	85	102	0	23.8N 123.9E	90	178	15	25.1N 119.8E	55	193	10
201800Z	21.4N 130.6E	70	21.7N 130.2E	65	29	-5	23.7N 125.1E	80	64	-10	25.2N 121.1E	60	184	-5	--.- ---.-	--	--	--
210000Z	22.0N 129.1E	75	21.8N 129.5E	65	25	-10	23.2N 125.2E	75	95	-20	24.3N 121.1E	65	142	5	--.- ---.-	--	--	--
210600Z	22.4N 127.6E	80	22.7N 127.5E	75	19	-5	24.5N 121.9E	80	115	-15	25.3N 115.9E	35	157	-20	--.- ---.-	--	--	--
211200Z	22.7N 126.1E	85	22.9N 126.2E	80	13	-5	24.2N 119.9E	50	92	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211800Z	22.7N 124.7E	90	22.8N 124.9E	85	13	-5	23.1N 119.5E	55	43	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	22.6N 123.6E	95	22.6N 123.3E	90	17	-5	22.3N 117.2E	70	106	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	22.6N 122.2E	95	22.5N 122.1E	90	8	-5	22.3N 116.3E	70	118	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	22.9N 120.8E	75	22.7N 120.9E	90	13	15	22.3N 115.3E	65	110	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	22.4N 119.7E	65	22.7N 119.3E	70	28	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	22.9N 119.0E	60	22.7N 118.7E	70	20	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	23.5N 118.0E	55	23.5N 117.8E	70	11	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	23.7N 116.6E	45	24.0N 116.8E	45	21	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	18NM	123NM	230NM	274NM	18NM	123NM	230NM	274NM
AVERAGE RIGHT ANGLE ERROR	12NM	77NM	152NM	206NM	11NM	77NM	152NM	206NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	9KTS	7KTS	12KTS	5KTS	9KTS	7KTS	12KTS
AVERAGE BIAS OF WIND ERROR	1KTS	1KTS	3KTS	9KTS	0KTS	1KTS	3KTS	9KTS
NUMBER OF FORECASTS	23	22	17	14	26	22	17	14

TYPHOON CORA

0600Z 01 OCT TO 0600Z 06 OCT

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
010600Z	14.0N 133.5E	30	14.1N 133.1E	30	24	0	17.2N 128.9E	45	188	10	18.7N 124.7E	55	351	-15	19.7N 121.2E	70	689	-30
011200Z	15.0N 132.8E	30	14.9N 132.0E	30	47	0	18.0N 127.6E	45	233	0	19.5N 123.6E	55	399	-25	20.7N 120.0E	65	796	-40
011800Z	16.2N 132.4E	30	16.0N 132.2E	30	17	0	19.2N 129.9E	40	91	-10	21.5N 126.8E	55	235	-25	23.3N 123.7E	65	656	-40
020000Z	17.5N 132.2E	30	17.5N 131.5E	30	40	0	21.4N 128.6E	40	55	-20	23.5N 125.0E	50	291	-40	24.7N 121.8E	65	842	-35
020600Z	18.7N 131.8E	35	19.3N 131.1E	35	53	0	23.7N 127.7E	55	98	-15	24.8N 123.6E	65	401	-35	25.1N 119.6E	55	1108	-45
021200Z	19.9N 131.2E	45	19.8N 131.4E	40	13	-5	24.0N 129.7E	55	33	-25	27.0N 126.8E	65	275	-40	30.5N 126.0E	55	861	-45
021800Z	20.7N 130.2E	50	20.6N 130.6E	40	23	-10	24.3N 128.7E	55	40	-25	27.9N 126.5E	55	378	-50	--.- ---.-	--	--	--
030000Z	21.8N 129.5E	60	21.8N 129.8E	45	17	-15	25.2N 127.6E	55	118	-35	28.8N 125.8E	55	539	-45	--.- ---.-	--	--	--
030600Z	22.8N 129.2E	70	22.7N 129.2E	60	6	-10	26.1N 127.0E	80	202	-20	29.9N 125.8E	80	689	-20	--.- ---.-	--	--	--
031200Z	23.7N 129.2E	80	23.6N 129.0E	85	12	5	27.0N 128.3E	100	207	-5	30.4N 131.8E	80	588	-20	--.- ---.-	--	--	--
031800Z	24.7N 129.3E	80	25.0N 129.2E	85	19	5	29.0N 131.0E	90	138	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	26.0N 129.6E	90	25.8N 129.4E	95	16	5	29.7N 131.7E	100	238	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	27.6N 130.4E	100	27.2N 130.3E	100	24	0	31.3N 134.4E	100	247	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	29.0N 131.5E	105	29.1N 131.4E	105	8	0	34.4N 137.3E	100	256	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041800Z	30.3N 133.2E	105	30.0N 132.8E	105	27	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050000Z	31.7N 135.7E	100	31.4N 135.6E	105	19	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050600Z	33.1N 138.8E	100	33.3N 138.3E	110	28	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051200Z	34.3N 142.5E	100	34.3N 142.3E	105	10	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	153NM	415NM	825NM	22NM	153NM	415NM	825NM
AVERAGE RIGHT ANGLE ERROR	12NM	83NM	230NM	420NM	16NM	83NM	230NM	420NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	13KTS	32KTS	39KTS	4KTS	13KTS	32KTS	39KTS
AVERAGE BIAS OF WIND ERROR	-0KTS	-11KTS	-32KTS	-39KTS	-0KTS	-11KTS	-32KTS	-39KTS
NUMBER OF FORECASTS	14	14	10	6	18	14	10	6

TYPHOON ELSIE

0000Z 09 OCT TO 0000Z 15 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
090000Z	12.7N 138.1E	25	12.9N 138.2E	25	13	0	15.6N 135.1E	35	115	-10	17.9N 131.8E	50	245	-25	19.9N 128.8E	65	326	-70
090600Z	13.2N 136.6E	30	12.9N 136.3E	30	25	0	13.9N 132.4E	45	181	-5	15.1N 128.5E	55	254	-40	16.3N 125.3E	70	303	-60
091200Z	14.2N 135.4E	30	13.1N 134.9E	30	72	0	13.8N 129.8E	45	218	-10	14.8N 125.0E	60	263	-65	16.0N 121.1E	70	287	-55
091800Z	15.3N 134.4E	35	13.9N 133.9E	30	88	-5	15.5N 129.5E	50	140	-10	16.8N 125.6E	65	190	-70	18.0N 121.5E	70	195	-45
100000Z	16.2N 133.2E	45	16.2N 133.5E	50	17	5	19.3N 129.8E	80	146	5	21.4N 127.7E	90	274	-45	23.1N 126.4E	100	400	-5
100600Z	16.9N 131.9E	50	17.1N 132.0E	55	13	5	20.5N 128.0E	80	139	-15	23.0N 125.9E	90	249	-40	24.7N 124.8E	100	385	0
101200Z	17.4N 130.4E	55	17.5N 130.5E	55	8	0	20.2N 126.2E	80	86	-45	24.6N 125.9E	90	340	-35	29.2N 133.0E	90	941	-5
101800Z	17.8N 129.0E	60	17.8N 129.1E	60	6	0	20.4N 124.5E	80	55	-55	25.0N 123.2E	85	279	-30	29.2N 130.7E	80	882	-10
110000Z	18.2N 127.5E	75	18.4N 127.5E	70	12	-5	21.3N 122.2E	85	84	-50	25.8N 121.6E	85	289	-20	30.2N 128.7E	80	872	-5
110600Z	18.8N 126.3E	95	18.7N 126.1E	70	13	-25	20.6N 120.9E	85	79	-45	24.1N 119.1E	75	146	-25	28.3N 121.4E	60	541	-10
111200Z	19.2N 125.1E	125	19.3N 124.9E	120	13	-5	21.3N 120.0E	130	78	5	23.0N 116.0E	100	126	5	--.- ---.-	--	--	--
111800Z	19.6N 124.0E	135	19.7N 124.0E	140	6	5	21.2N 120.0E	120	23	5	21.7N 115.0E	100	89	10	21.6N 110.0E	50	141	10
120000Z	20.1N 123.0E	135	20.1N 123.0E	140	0	5	21.6N 119.1E	120	21	15	21.9N 113.9E	100	78	15	21.7N 108.9E	45	156	10
120600Z	20.5N 122.3E	130	20.5N 122.1E	130	11	0	21.8N 118.1E	120	28	20	22.2N 113.0E	90	67	20	--.- ---.-	--	--	--
121200Z	20.8N 121.3E	125	20.9N 121.7E	125	23	0	22.0N 118.5E	110	50	15	22.7N 114.2E	90	61	35	--.- ---.-	--	--	--
121800Z	21.1N 120.4E	115	21.1N 120.6E	120	11	5	22.2N 117.2E	100	45	10	23.1N 112.6E	60	66	20	--.- ---.-	--	--	--
130000Z	21.4N 119.4E	105	21.4N 119.3E	110	6	5	22.5N 115.2E	90	36	5	22.8N 111.0E	35	61	0	--.- ---.-	--	--	--
130600Z	21.7N 118.6E	100	21.6N 118.3E	100	18	0	22.5N 114.2E	90	30	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131200Z	21.6N 117.7E	95	21.7N 117.4E	95	18	0	21.9N 112.8E	75	34	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131800Z	21.7N 116.6E	90	21.8N 116.3E	90	18	0	21.9N 111.5E	60	56	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	21.9N 115.3E	85	21.8N 115.3E	80	6	-5	21.8N 111.3E	65	25	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140600Z	22.0N 114.2E	70	21.9N 114.1E	65	8	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141200Z	22.0N 113.4E	55	21.9N 113.3E	55	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141800Z	22.0N 112.5E	40	21.9N 113.0E	40	28	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150000Z	22.0N 111.7E	35	22.0N 112.5E	20	44	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	80NM	181NM	452NM	19NM	80NM	181NM	452NM
AVERAGE RIGHT ANGLE ERROR	10NM	54NM	134NM	330NM	13NM	54NM	134NM	330NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	20KTS	29KTS	24KTS	4KTS	20KTS	29KTS	24KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	-4KTS	-17KTS	-20KTS	-1KTS	-4KTS	-17KTS	-20KTS
NUMBER OF FORECASTS	22	21	17	12	25	21	17	12

TYPHOON FLOSSIE

0000Z 20 OCT TO 1200Z 23 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
200000Z	15.6N 117.4E	30	15.8N 117.0E	30	26	0	16.2N 114.9E	45	68	0	16.3N 112.4E	50	196	-10	15.8N 110.0E	50	297	-15
200600Z	15.3N 116.0E	30	15.7N 116.0E	30	24	0	16.0N 113.1E	45	196	0	16.2N 110.1E	50	284	-15	15.8N 107.4E	35	370	-15
201200Z	15.7N 116.4E	30	15.7N 115.5E	30	52	0	15.8N 113.3E	45	200	-5	16.0N 110.9E	50	236	-20	--.- ---.-	--	--	--
201800Z	15.5N 115.8E	40	15.6N 115.8E	40	6	0	15.7N 114.1E	55	157	0	16.0N 111.7E	60	230	-10	--.- ---.-	--	--	--
210000Z	15.8N 116.0E	45	15.6N 115.8E	45	17	0	15.8N 115.2E	50	143	-10	16.4N 114.1E	55	280	-10	--.- ---.-	--	--	--
210600Z	16.3N 116.5E	45	15.9N 115.9E	45	42	0	16.4N 115.6E	50	148	-15	17.4N 114.7E	55	324	5	--.- ---.-	--	--	--
211200Z	16.9N 116.6E	50	16.8N 116.5E	50	8	0	18.6N 116.2E	65	149	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211800Z	17.6N 116.0E	55	17.7N 116.6E	55	35	0	19.9N 115.7E	65	163	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	18.2N 115.2E	60	18.9N 115.0E	60	43	0	20.8N 112.2E	65	33	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	18.6N 114.4E	65	18.5N 114.3E	65	8	0	18.7N 111.8E	75	164	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	19.0N 113.6E	70	18.8N 113.6E	70	12	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	19.7N 112.8E	70	19.2N 112.7E	70	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	20.5N 111.7E	65	20.4N 111.7E	70	6	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	21.2N 110.6E	50	21.1N 110.9E	50	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	142NM	258NM	333NM	23NM	142NM	258NM	333NM
AVERAGE RIGHT ANGLE ERROR	12NM	83NM	176NM	324NM	12NM	83NM	176NM	324NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	7KTS	12KTS	15KTS	0KTS	7KTS	12KTS	15KTS
AVERAGE BIAS OF WIND ERROR	0KTS	-2KTS	-10KTS	-15KTS	0KTS	-2KTS	-10KTS	-15KTS
NUMBER OF FORECASTS	11	10	6	2	14	10	6	2

TYPHOON IDA

0600Z 06 NOV TO 1200Z 11 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
060600Z	11.7N 149.6E	25	10.1N 149.2E	25	98	0	11.2N 145.5E	45	287	15	11.8N 140.2E	55	543	10	12.0N 134.8E	65	758	5
061200Z	12.4N 149.5E	25	11.9N 146.6E	25	172	0	13.4N 142.5E	45	408	15	14.3N 137.7E	55	604	10	14.3N 132.3E	65	823	5
061800Z	12.9N 149.6E	25	11.2N 147.7E	25	150	0	13.1N 143.5E	40	346	10	14.1N 139.2E	55	494	5	14.3N 134.7E	65	727	-5
070000Z	13.3N 149.7E	25	12.7N 148.5E	25	78	0	14.0N 144.5E	40	268	5	15.2N 140.5E	55	376	0	16.2N 136.4E	65	642	-10
070600Z	13.7N 149.7E	30	13.0N 149.2E	30	51	0	13.6N 147.3E	45	168	0	14.5N 144.1E	60	299	0	15.5N 140.1E	70	641	-10
071200Z	14.1N 149.5E	30	13.8N 148.9E	35	39	5	14.6N 146.3E	45	172	0	15.5N 142.6E	60	318	0	16.0N 137.6E	70	840	-15
071800Z	14.8N 149.2E	30	14.6N 148.5E	35	40	5	15.2N 146.3E	45	159	-5	15.8N 142.8E	60	347	-10	16.1N 138.0E	70	993	-10
080000Z	15.4N 148.9E	35	14.8N 148.5E	40	43	5	15.4N 146.5E	60	187	5	16.4N 142.4E	75	404	0	--.-	---.-	--	--	--
080600Z	16.2N 148.4E	45	15.3N 148.3E	45	54	0	16.2N 146.1E	65	187	5	17.4N 142.6E	80	469	0	--.-	---.-	--	--	--
081200Z	17.1N 147.8E	45	16.5N 147.7E	45	36	0	18.9N 145.5E	65	72	5	21.2N 143.9E	70	373	-15	--.-	---.-	--	--	--
081800Z	17.8N 146.9E	50	17.6N 147.0E	45	13	-5	20.3N 144.5E	65	65	-5	23.8N 144.7E	70	402	-10	--.-	---.-	--	--	--
090000Z	18.5N 146.1E	55	18.5N 146.3E	55	11	0	21.6N 144.3E	70	91	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090600Z	19.3N 145.6E	60	19.1N 145.8E	60	16	0	22.1N 144.2E	65	190	-15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091200Z	20.1N 145.4E	60	20.1N 145.2E	60	11	0	23.4N 143.8E	65	283	-20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091800Z	21.1N 145.3E	70	21.3N 144.9E	65	25	-5	25.5N 145.9E	65	281	-15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
100000Z	22.4N 145.7E	75	22.3N 145.7E	70	6	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
100600Z	24.2N 146.8E	80	23.4N 146.1E	80	61	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101200Z	26.2N 148.0E	85	26.1N 148.3E	80	17	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101800Z	29.5N 148.7E	80	28.7N 148.9E	80	49	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	29NM	177NM	421NM	775NM	51NM	211NM	421NM	775NM
AVERAGE RIGHT ANGLE ERROR	17NM	108NM	299NM	596NM	41NM	150NM	299NM	596NM
AVERAGE MAGNITUDE OF WIND ERROR	2KTS	7KTS	5KTS	9KTS	2KTS	6KTS	5KTS	9KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	-4KTS	-1KTS	-6KTS	-0KTS	-0KTS	-1KTS	-6KTS
NUMBER OF FORECASTS	12	12	11	7	19	15	11	7

TYPHOON JUNE

0600Z 16 NOV TO 0000Z 24 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
160600Z	6.7N 143.1E	25	7.2N 142.9E	25	32	0	7.5N 139.0E	35	216	-25	8.5N 134.2E	45	490	-30	10.1N 128.4E	55	779	-95
161200Z	6.3N 142.6E	30	6.6N 142.4E	30	21	0	6.7N 138.8E	40	208	-25	8.0N 134.1E	50	493	-35	9.9N 129.0E	60	729	-100
161800Z	6.4N 142.9E	40	6.3N 142.3E	35	36	-5	6.1N 140.5E	45	124	-25	6.8N 137.3E	55	359	-45	8.5N 132.7E	65	546	-85
170000Z	6.6N 142.5E	50	6.5N 142.7E	40	13	-10	6.4N 141.0E	55	122	-20	7.1N 137.0E	65	378	-70	8.7N 132.5E	75	533	-70
170600Z	6.9N 142.6E	60	6.8N 142.2E	50	24	-10	6.8N 140.2E	70	181	-5	7.3N 136.2E	80	432	-70	9.1N 131.7E	70	532	-70
171200Z	6.7N 142.3E	65	6.8N 142.2E	60	8	-5	7.1N 140.9E	80	171	-5	8.2N 137.0E	100	380	-60	9.4N 132.5E	120	480	-20
171800Z	7.3N 142.2E	70	7.3N 142.1E	65	6	-5	7.9N 140.9E	85	171	-15	9.5N 137.2E	105	314	-45	11.0N 132.6E	125	412	-15
180000Z	7.9N 142.4E	75	7.5N 142.2E	70	27	-5	9.0N 141.5E	100	139	-35	10.8N 137.9E	120	231	-25	11.5N 133.1E	130	377	-10
180600Z	8.8N 142.5E	75	8.6N 142.7E	75	17	0	11.4N 143.2E	100	113	-50	13.8N 141.8E	110	189	-30	15.6N 138.3E	110	174	-25
181200Z	9.6N 142.3E	85	9.7N 142.3E	80	6	-5	12.4N 142.3E	100	90	-60	14.2N 141.2E	110	191	-30	16.0N 137.5E	120	182	-10
181800Z	10.5N 142.1E	100	10.4N 142.3E	90	13	-10	13.2N 142.3E	125	122	-25	16.2N 139.8E	130	133	-10	17.3N 135.8E	110	132	-15
190000Z	11.3N 141.8E	135	11.5N 142.0E	105	17	-30	14.9N 141.1E	130	94	-15	17.1N 137.7E	130	57	-10	17.5N 133.5E	110	206	-10
190600Z	12.3N 141.5E	150	12.3N 141.6E	140	6	-10	15.7N 140.7E	150	127	10	19.2N 140.3E	125	264	-10	23.5N 141.3E	100	358	-15
191200Z	13.2N 141.0E	160	13.3N 141.2E	150	13	-10	16.9N 140.1E	150	149	10	20.4N 139.3E	125	253	-5	24.4N 140.9E	100	316	-10
191800Z	13.8N 140.3E	150	13.9N 140.2E	160	8	10	17.0N 138.3E	150	75	10	20.6N 137.7E	125	163	0	24.5N 139.7E	100	193	-5
200000Z	14.3N 139.6E	145	14.7N 139.6E	145	24	0	17.9N 138.1E	115	103	-25	21.6N 137.7E	90	157	-30	25.0N 140.4E	80	163	-20
200600Z	14.8N 138.7E	140	14.8N 138.6E	140	6	0	17.5N 136.0E	115	0	-20	21.0N 135.3E	90	43	-25	24.7N 137.7E	80	190	-10
201200Z	15.3N 138.1E	140	15.2N 138.1E	140	6	0	17.2N 135.3E	120	66	-10	20.1N 134.5E	105	169	-5	--.-	---.-	--	--	--
201800Z	16.0N 137.5E	140	15.8N 137.6E	140	13	0	17.9N 135.0E	125	90	0	20.7N 133.7E	110	241	5	--.-	---.-	--	--	--
210000Z	16.7N 136.8E	140	16.5N 136.6E	135	17	-5	19.2N 134.2E	115	98	-5	23.3N 134.3E	90	207	-10	--.-	---.-	--	--	--
210600Z	17.5N 136.0E	135	17.6N 136.0E	135	6	0	21.1N 134.2E	115	62	0	25.1N 136.9E	90	204	0	--.-	---.-	--	--	--
211200Z	18.3N 135.4E	130	18.3N 135.4E	130	0	0	21.7N 133.7E	105	115	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
211800Z	19.4N 135.1E	125	19.2N 134.8E	120	21	-5	22.6N 133.5E	95	170	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
220000Z	20.6N 135.1E	120	20.5N 135.1E	120	6	0	25.1N 136.8E	95	35	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
220600Z	21.7N 135.1E	115	21.5N 135.2E	120	13	5	26.1N 137.5E	95	144	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
221200Z	22.8N 135.4E	110	22.7N 135.5E	110	8	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
221800Z	24.0N 136.2E	105	23.7N 135.6E	105	37	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
230000Z	25.3N 137.4E	100	25.6N 138.0E	105	37	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
230600Z	27.2N 139.9E	90	26.6N 139.5E	100	42	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	16NM	119NM	255NM	371NM	17NM	119NM	255NM	371NM
AVERAGE RIGHT ANGLE ERROR	9NM	[illegible]	190NM	286NM	9NM	81NM	190NM	286NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	17KTS	26KTS	34KTS	5KTS	17KTS	26KTS	34KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-14KTS	-26KTS	-34KTS	-3KTS	-14KTS	-26KTS	-34KTS
NUMBER OF FORECASTS	27	25	21	17	29	25	21	17

5. INDIAN OCEAN AREA CYCLONE DATA

TROPICAL CYCLONE 04-75

0800Z 10 JAN TO 0800Z 11 JAN

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100600Z	16.2N	93.8E	35	16.2N	99.3E	35	315	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101200Z	17.3N	94.3E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101800Z	18.4N	94.8E	25	17.8N	94.4E	30	42	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110000Z	19.3N	95.3E	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	179NM	0NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	149NM	0NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	3KTS	0KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	3KTS	0KTS	0KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	2	0	0	0

TROPICAL CYCLONE 24-75

0600Z 02 MAY TO 0000Z 12 MAY

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
020600Z	10.4N	70.9E	35	11.3N	72.0E	35	84	0	13.9N	71.7E	50	165	0	16.3N	70.2E	60	245	-5	--.-	---.-	--	--	--
021200Z	10.7N	70.7E	40	11.6N	72.0E	40	93	0	14.2N	71.6E	55	175	0	16.8N	71.0E	65	266	-5	--.-	---.-	--	--	--
021800Z	10.9N	70.6E	45	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
030000Z	11.2N	70.4E	50	12.1N	70.9E	50	61	0	13.6N	69.6E	60	100	-5	15.3N	67.3E	70	227	-5	--.-	---.-	--	--	--
030600Z	11.5N	70.3E	50	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
031200Z	11.6N	70.2E	55	12.2N	70.9E	60	54	5	13.5N	69.9E	70	70	0	14.9N	68.5E	70	128	-15	--.-	---.-	--	--	--
031800Z	11.8N	70.2E	60	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
040000Z	12.0N	70.1E	65	13.1N	68.9E	60	96	-5	14.3N	67.1E	70	210	-5	15.6N	65.3E	70	273	-10	--.-	---.-	--	--	--
040600Z	12.2N	70.2E	65	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
041200Z	12.4N	70.3E	70	13.2N	69.8E	70	56	0	14.5N	69.1E	75	86	-10	16.1N	68.3E	80	122	10	--.-	---.-	--	--	--
041800Z	12.7N	70.4E	70	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
050000Z	13.1N	70.5E	75	13.9N	70.4E	70	48	-5	15.4N	69.9E	75	72	-5	17.7N	69.4E	80	257	10	--.-	---.-	--	--	--
050600Z	13.5N	70.5E	80	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
051200Z	13.8N	70.4E	85	13.3N	70.2E	75	32	-10	14.0N	70.2E	85	87	15	15.4N	70.6E	85	247	5	--.-	---.-	--	--	--
051800Z	14.0N	70.2E	85	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
060000Z	14.2N	69.8E	80	14.4N	70.0E	75	17	-5	15.8N	70.4E	85	206	15	17.3N	71.2E	85	352	-5	--.-	---.-	--	--	--
060600Z	14.2N	69.4E	75	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
061200Z	14.1N	68.7E	70	15.2N	69.2E	65	72	-5	17.0N	69.5E	50	255	-30	19.1N	70.8E	35	401	-55	--.-	---.-	--	--	--
061800Z	14.0N	68.1E	65	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
070000Z	13.8N	67.5E	70	15.9N	66.9E	65	149	-5	17.6N	69.4E	55	288	-35	19.5N	70.6E	45	392	-35	--.-	---.-	--	--	--
070600Z	13.7N	66.9E	75	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071200Z	13.7N	66.7E	80	14.1N	66.8E	70	25	-10	14.7N	66.1E	75	25	-15	15.5N	65.5E	75	8	5	--.-	---.-	--	--	--
071800Z	13.8N	66.4E	85	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080000Z	13.9N	66.2E	90	14.0N	66.7E	75	30	-15	14.8N	65.2E	80	26	0	16.0N	63.4E	85	104	25	--.-	---.-	--	--	--
080600Z	14.1N	66.0E	95	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081200Z	14.4N	65.8E	90	14.9N	66.0E	65	32	-25	16.0N	65.0E	65	33	-5	17.4N	63.9E	65	83	15	--.-	---.-	--	--	--
081800Z	14.6N	65.7E	85	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	15.0N	65.6E	80	15.4N	65.4E	65	27	-15	16.6N	64.5E	65	47	5	18.3N	63.2E	65	124	25	--.-	---.-	--	--	--
090600Z	15.3N	65.5E	75	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091200Z	15.6N	65.4E	70	15.8N	64.5E	65	53	-5	17.0N	63.4E	65	96	15	18.1N	62.3E	65	125	35	--.-	---.-	--	--	--
091800Z	15.9N	65.3E	65	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
100000Z	16.2N	65.2E	60	15.5N	64.5E	65	58	5	16.5N	62.8E	65	117	25	17.8N	61.1E	60	156	35	--.-	---.-	--	--	--
100600Z	16.4N	65.1E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101200Z	16.5N	65.0E	50	16.6N	64.0E	60	58	10	17.4N	62.5E	50	108	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101800Z	16.7N	64.9E	45	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110000Z	16.9N	64.8E	40	16.9N	63.3E	50	86	10	17.8N	62.2E	35	96	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110600Z	17.2N	64.6E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111200Z	17.5N	64.4E	30	17.0N	63.7E	40	50	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111800Z	17.9N	64.1E	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
120000Z	18.3N	63.8E	25	18.5N	64.5E	25	41	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	58NM	119NM	206NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	48NM	83NM	136NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	7KTS	11KTS	18KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	-3KTS	-0KTS	2KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	21	19	17	0

TROPICAL CYCLONE 25-75

2000Z 05 MAY TO 0800Z 08 MAY

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
051800Z	14.3N 94.9E	35	15.2N 93.8E	40	83	5	18.9N 92.2E	55	192	-20	23.0N 93.0E	20	347	-20	--.- ---.-	--	--	--
060000Z	14.8N 94.4E	40	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060600Z	15.1N 93.9E	50	15.5N 93.9E	45	24	-5	18.0N 92.7E	55	98	-15	21.3N 92.3E	55	308	35	--.- ---.-	--	--	--
061200Z	15.4N 93.5E	65	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	15.8N 93.1E	75	15.9N 93.0E	50	8	-25	17.8N 91.6E	55	194	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	16.3N 93.2E	75	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	16.6N 93.6E	70	16.6N 93.3E	65	17	-5	18.9N 92.7E	75	249	55	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	17.0N 94.2E	65	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	17.5N 95.0E	40	17.3N 94.2E	60	47	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	18.1N 96.0E	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080600Z	18.8N 97.1E	20	18.9N 97.4E	25	18	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	33NM	183NM	328NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	11NM	131NM	305NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	11KTS	26KTS	28KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	-1KTS	9KTS	8KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	6	4	2	0

TROPICAL CYCLONE 28-75

2000Z 20 OCT TO 0800Z 22 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
201800Z	19.4N 68.9E	35	19.9N 69.9E	35	64	0	21.4N 67.5E	35	83	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	19.5N 68.6E	40	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210600Z	19.6N 68.3E	50	19.8N 67.8E	40	31	-10	19.9N 66.2E	45	193	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	19.8N 68.2E	60	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211800Z	20.3N 68.4E	70	20.7N 68.4E	55	24	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	20.8N 68.8E	80	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	21.5N 69.2E	80	21.4N 69.1E	85	8	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	32NM	138NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	26NM	96NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	8KTS	35KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	-5KTS	-35KTS	0KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	4	2	0	0

TROPICAL CYCLONE 29-75

2000Z 07 NOV TO 0800Z 12 NOV

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
071800Z	14.1N	83.4E	35	14.6N	83.0E	30	38	-5	16.1N	80.1E	30	166	-10	18.0N	78.1E	20	443	-25	--.-	---.-	--	--	--
080000Z	14.6N	82.7E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080600Z	15.2N	82.2E	35	14.9N	81.8E	40	29	5	15.7N	79.9E	30	289	-10	16.7N	78.0E	20	559	-30	--.-	---.-	--	--	--
081200Z	16.1N	82.3E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081800Z	16.8N	82.9E	40	16.3N	81.5E	35	86	-5	17.9N	79.4E	20	370	-25	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	17.4N	83.6E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090600Z	17.7N	84.5E	40	17.7N	85.3E	35	46	-5	18.6N	86.1E	45	85	-5	19.6N	86.8E	55	231	15	--.-	---.-	--	--	--
091200Z	18.0N	85.3E	45	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091800Z	18.3N	85.9E	45	18.8N	86.1E	35	32	-10	20.8N	88.1E	35	59	-10	22.7N	90.4E	30	51	-5	--.-	---.-	--	--	--
100000Z	18.6N	86.6E	50	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
100600Z	19.1N	87.5E	50	19.1N	87.9E	45	23	-5	20.9N	90.1E	45	40	5	22.4N	92.6E	30	69	5	--.-	---.-	--	--	--
101200Z	19.7N	88.4E	45	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101800Z	20.3N	89.0E	45	20.3N	89.4E	45	22	0	23.1N	92.5E	35	75	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110000Z	20.9N	89.7E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110600Z	21.5N	90.4E	40	20.5N	88.6E	45	117	5	22.5N	92.2E	35	53	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111200Z	22.1N	90.9E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111800Z	22.5N	91.3E	35	21.9N	90.7E	45	49	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
120000Z	22.9N	91.6E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
120600Z	23.3N	91.8E	25	22.3N	91.6E	35	61	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	50NM	142NM	271NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	27NM	78NM	133NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	6KTS	9KTS	16KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	0KTS	-6KTS	-8KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	10	8	5	0

TROPICAL CYCLONE 33-75

0800Z 25 NOV TO 0800Z 01 DEC

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
250600Z	12.0N	83.8E	35	12.4N	84.0E	35	27	0	14.0N	83.4E	40	199	10	16.1N	84.1E	50	175	15	--.-	---.-	--	--	--
251200Z	12.1N	82.9E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
251800Z	12.2N	82.0E	35	13.5N	81.9E	35	78	0	17.2N	80.0E	20	227	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
260000Z	12.5N	81.0E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
260600Z	12.8N	80.2E	30	12.8N	80.2E	35	0	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
261200Z	13.2N	80.0E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
261800Z	13.4N	80.1E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
270000Z	13.9N	80.5E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
270600Z	14.6N	81.5E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
271200Z	15.2N	82.4E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
271800Z	15.8N	83.5E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
280000Z	16.1N	84.7E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
280600Z	16.0N	85.9E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
281200Z	15.8N	86.9E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
281800Z	15.2N	87.6E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
290000Z	14.4N	88.0E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
290600Z	13.6N	88.1E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
291200Z	12.9N	88.2E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
291800Z	12.3N	88.1E	35	13.7N	90.5E	35	163	0	14.2N	93.7E	45	426	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
300000Z	11.7N	87.7E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
300600Z	11.6N	86.8E	30	15.0N	87.0E	35	203	5	15.7N	87.5E	40	121	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
301200Z	12.5N	86.6E	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
301800Z	13.4N	86.4E	25	15.2N	87.1E	35	115	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
010000Z	14.6N	85.9E	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
010600Z	15.6N	85.4E	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	98NM	243NM	175NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	65NM	187NM	5NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	3KTS	15KTS	15KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	3KTS	10KTS	15KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	6	4	1	0

APPENDIX

ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Abbreviations, acronyms and definitions which apply for the purpose of this report.

1. ABBREVIATIONS AND ACRONYMS

AC&W	Aircraft Control and Warning
AIREP	Aircraft Weather Reports (Commercial and Military)
AJTWC	Alternate Joint Typhoon Warning Center
APT	Automatic Picture Transmission
AWN	Automatic Weather Network
AWS	Air Weather Service
CINCPAC	Commander in Chief Pacific
CINCPACAF	Commander in Chief Pacific Air Force
CINCPACFLT	Commander in Chief U. S. Pacific Fleet
CDRUSACSG	Commander, U. S. Army CINCPAC Support Group
DMSP	Defense Meteorological Satellite Program
ENVPREDRSCHFAC	Environmental Prediction Research Facility
FLEWEACEN/JTWC	Fleet Weather Central/ Joint Typhoon Warning Center
NAVWEASERVCOM	Naval Weather Service Command
NESS	National Environmental Satellite Service
NOAA/NWS	National Oceanic and Atmospheric Administration, National Weather Service
PACOM	Pacific Command
SLP (MSLP)	Sea Level Pressure (Minimum Sea Level Pressure)
TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
TC	Tropical Cyclone
TD	Tropical Depression
TS	Tropical Storm
TY	Typhoon
WMO	World Meteorological Organization

2. DEFINITIONS

ALTERNATE JOINT TYPHOON WARNING CENTER-The AJTWC is Detachment 17/Asian Tactical Forecast Unit, 20th Weather Squadron, Yokota AB, Japan with assistance from the Naval Weather Service Facility, Yokosuka, Japan.

CYCLONE-A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the northern hemisphere).

EXTRATROPICAL-A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical characteristics". The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy sources from release of latent heat of condensation to baroclinic processes. The term carries no implication as to strength or size.

EYE/CENTER-Refers to the roughly circular central area of a well developed tropical cyclone usually characterized by comparatively light winds and fair weather. If more than half surrounded by wall cloud, the word "eye" is used, otherwise the area is referred to as a center.

MAXIMUM SUSTAINED WIND-Maximum surface wind speed, over water, in a cyclone averaged over a 1-minute period of time. Wind speed is subject to gusts which bring a sudden temporary increase in speed (i.e., on the order of a few seconds). Peak gusts over water average 20 to 25 percent higher than the sustained 1-minute wind speed.

SIGNIFICANT TROPICAL CYCLONE-A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUSPICIOUS AREA-An area suspected of containing a developing or existing tropical cyclone.

TROPICAL CYCLONE-A nonfrontal low pressure system of synoptic scale developing over tropical or subtropical waters and having definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR-A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION-A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 kt or less.

TROPICAL DISTURBANCE-A discrete system of apparently organized convection--generally 100 to 300 miles in diameter--originating in the tropics or subtropics, having a nonfrontal migratory character, and having maintained its identity for 24 hr or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical depression, storm or typhoon.

TROPICAL STORM-A warm-core tropical cyclone in which the maximum sustained surface wind (1-minute mean) ranges from 34 to 63 kt inclusive.

TYPHOON/HURRICANE-A warm-core tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 64 kt or greater.

SUPER TYPHOON-A warm core tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 130 kt or greater.

WALL CLOUD-An organized band of cumuliform clouds immediately surrounding the central area of a tropical cyclone.

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Annual publication summarizing the tropical cyclone season in the western North Pacific, the North Indian Ocean, and the central North Pacific. A brief narrative is given on each typhoon in the western North Pacific including the best track. Forecast verification data and statistics for JTWC are summarized. Research efforts at JTWC are discussed briefly.

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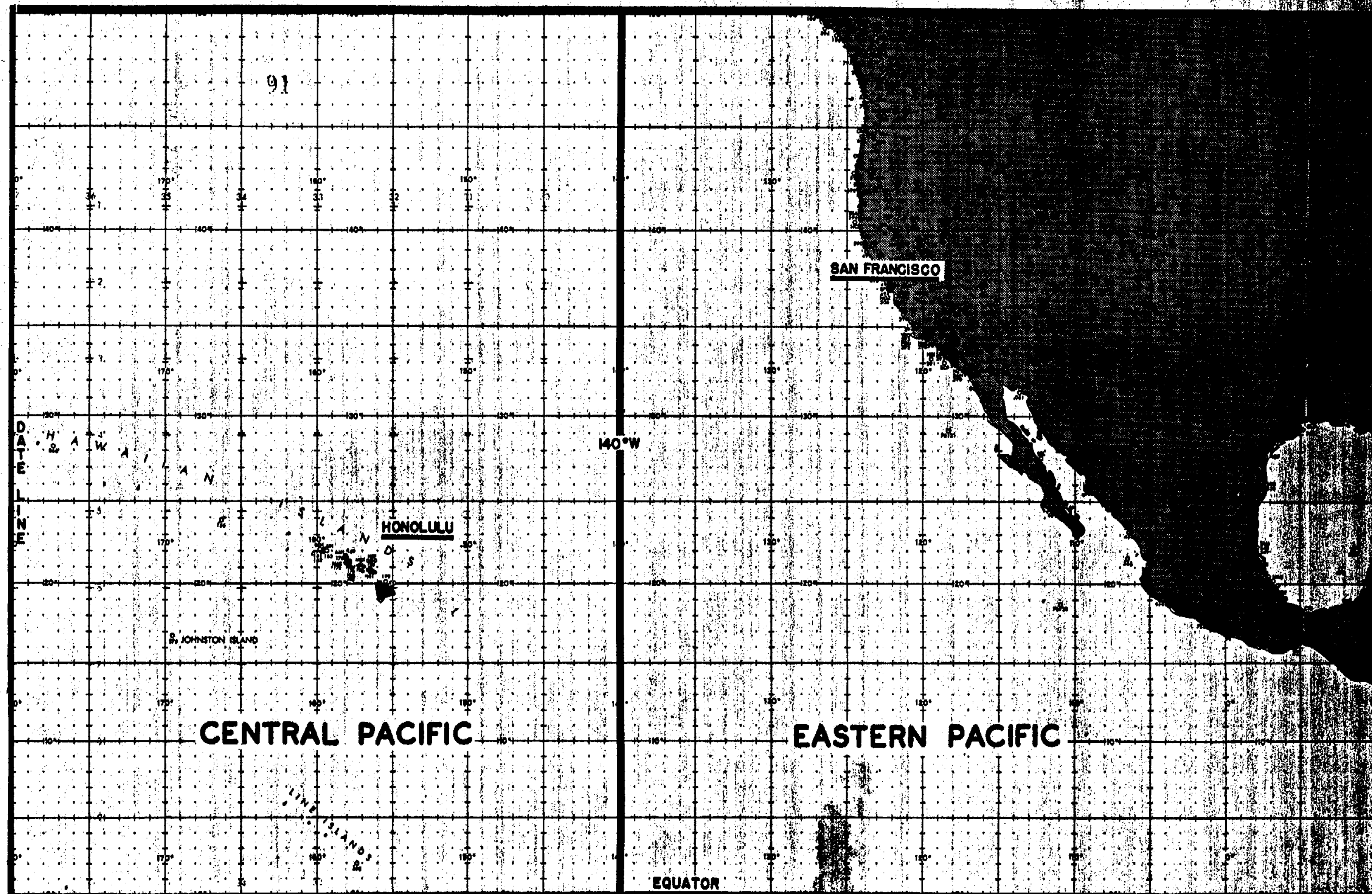

Areas of Responsibility - Central and Eastern Pacific Hurricane Centers

June A Supertyphoon
THE WORST TYPHOON yet recorded, according to Detachment 1, 1st Weather Wing officials at Nimitz Hill, Guam, is Typhoon June. This "superphoon" attained maximum winds estimated at 160 knots and had a record low sea-level pressure of 876 millibars. June passed within 200 nautical miles of Guam on Nov. 19, 1975, lashing the small island with galeforce winds and high seas. June was watched by the Defense Meteorological Satellite Program and the 54th Weather Reconnaissance Squadron, which flew out of Andersen AFB, Guam. (DMSP photo, courtesy of Det. 1, 1WW)
Super Storm Rips Guam, Heads for Oki
Phyllis Kills 17 —Thousands of Homes Flooded
Typhoon Da
$303,787,
Island Damage Heavy
Typhoon Hits Taiwan!
Island Battered
34 Dead, 23 M
10 Dead, 10 Missing
Fate Of 47 Unknown
Combined Toll Reaches 90 Dead
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